Science and Invention

25¢

MARCH

Goddard on Rocket Flight

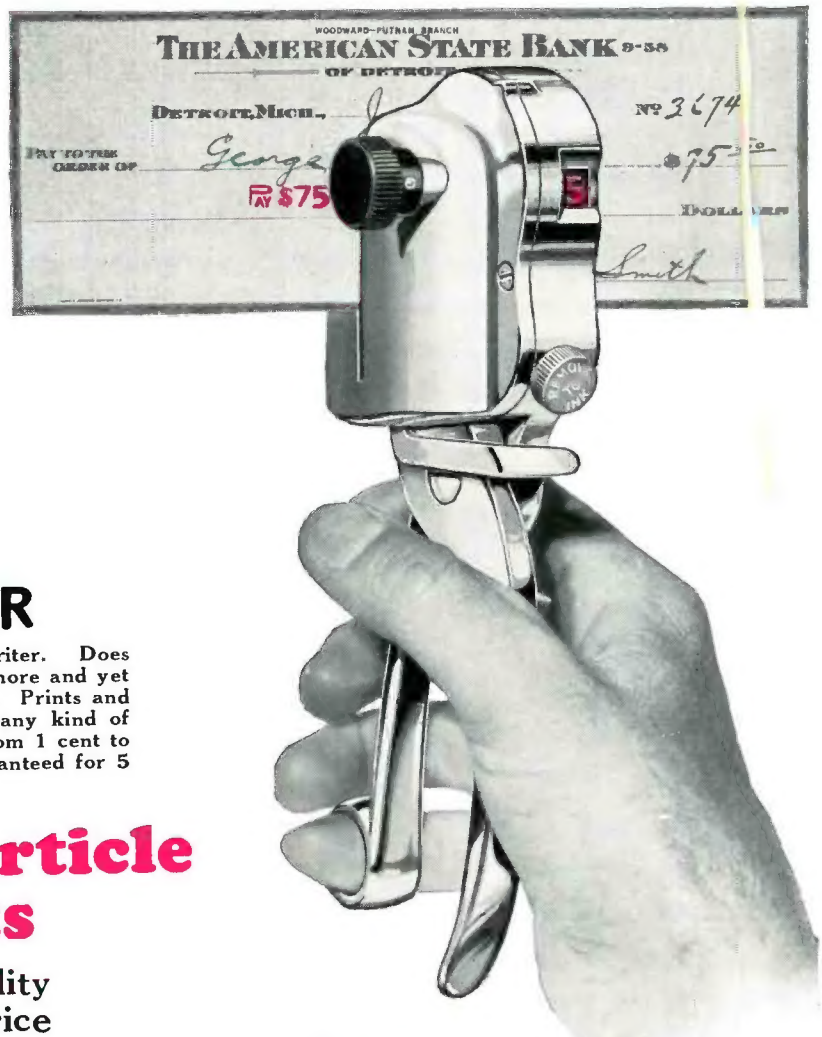
Make Your Own Glider
by Lieut. Reynolds

Have a Basement Playroom

Get Into the "High-Income" Class!

Don't Be Satisfied With Just a Living!

You Can Make As Much As a Bank President!



ARNOLD CHECK-WRITER

The World's lowest priced check-writer. Does work equal to machines costing $60 or more and yet costs no more than a good fountain pen. Prints and cuts exact figures in acid-proof ink on any kind of paper. Writes checks for any amount from 1 cent to billions of dollars. Unconditionally guaranteed for 5 years—but built to last a lifetime.

A Sure-Fire Article for Agents

—because of its quality and amazingly low price

Just what every person who writes checks has long been wanting—a low-priced check-writer that gives full protection against the wiles of the cunning check-raiser. Every man and woman in your vicinity who has a checking account is a prospect—individuals as well as business men—the easiest class of people to sell to, because they all have bank accounts.

You'll be surprised to find how quickly people buy when they see this simple device which protects the amount on any check by printing the figures right through the paper so that the ink soaks into the shreds and actually becomes a part of the paper itself. It takes only a few seconds to demonstrate—and it's the convincing kind of demonstration that results in quick sales!

Do you want a permanent, dignified position with immediate earnings and a brilliant future? Would you like to make a fresh start in life? Then join the Arnold organization today! Some of our agents are making as much as bank presidents. Let us show you how you can get into this fascinating profession and enjoy a worth-while income from now on!

$5 Profit On Every Sale!

The Arnold Check-Writer sells at an amazingly low price, yet nets a profit several times as large as most articles sold by agents—$5 PROFIT ON EVERY SALE. A proposition with a practically unlimited market—good for $30 a day, week in and week out!

Send coupon for SPECIAL OFFER on Demonstrator and complete details of our attractive offer which enables you to make a day's pay in an hour a day.

Arnold Check-Writer Co., Inc.
871 East Taylor Street, Flint, Mich.

Arnold Check-Writer Co., Inc.
871 East Taylor St., Flint, Mich.

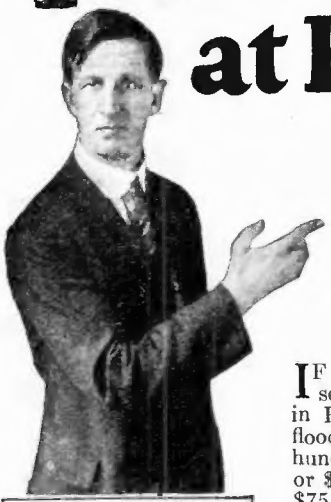
Please send me details of your Special Offer on Demonstrator and full information about your unusual sales plan.

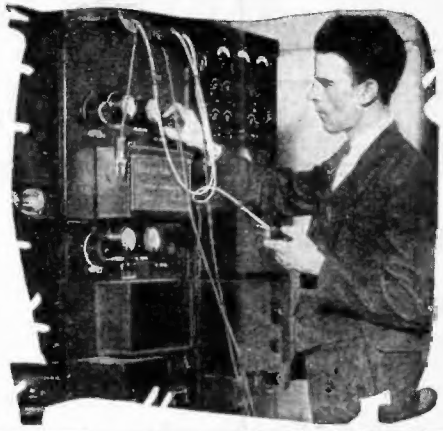
Name .....

Address .....

City ..... State .....

I Will Train You at Home to Fill a Big-Pay Radio Job





IF you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into this new business, creating hundreds of big pay jobs. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50, $75, and up to $250 a week? My book, "Rich Rewards in Radio," gives full information on these big jobs and explains how you can quickly become a Radio Expert through my easy, practical, home-study training.

Salaries of $50 to $250 a Week Not Unusual

Get into this live-wire profession of quick success. Radio needs trained men. The amazing growth of the Radio business has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth of Radio is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs. Study Radio and after only a short time land yourself a REAL job with a REAL future.

You Can Learn Quickly and Easily in Spare Time

Hundreds of N. R. I. trained men are today making big money—holding down big jobs—in the Radio field. Men just like you—their only advantage is training. You, too, can become a Radio Expert just as they did by our new practical methods. Our tested, clear training, makes it easy for you to learn. You can stay home, hold your job, and learn quickly in your spare time. Lack of education or experience are no drawbacks. You can read and write. That's enough.

Many Earn $15, $20, $30 Weekly on the Side While Learning

My Radio course is the famous course "that pays for itself." I teach you to begin making money almost the day you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts with my course. You are taught to build practically every type of receiving set known. M. E. Sullivan, 412 73rd Street, Brooklyn, N. Y., writes, "I made $720 while studying." Earle Cummings, 18 Webster Street, Haverhill, Mass.: "I made $375 in one month." G. W. Page, 1807 21st Ave., Nashville, Tenn.: "I picked up $935 in my spare time while studying."

Your Money Back If Not Satisfied

"I'll give you just the training you need to get into the Radio business. My course fits you for all lines—manufacturing, selling, servicing sets, in business for yourself, operating on board ship or in a broadcasting station—and many others. I back up my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the course I give you.

Act Now—NEW 64-Page Book is FREE

Send for this big book of Radio information. It won't cost you a penny. It has put hundreds of fellows on the road to bigger pay and success. Get it. Investigate. See what Radio has to offer you, and how my Employment Department helps you get into Radio after you graduate. Clip or tear out the coupon and mail it RIGHT NOW.

J. E. SMITH, President
Dept. OCS
National Radio Institute
Washington, D. C.

RADIO NEEDS TRAINED MEN!

Here's the PROOF

$375 One Month in Spare Time

"Recently I made $375 in one month in my spare time installing, servicing, selling Radio Sets."
Earle Cummings,
18 Webster St.,
Haverhill, Mass.

Jumped from $35 to $100 a Week

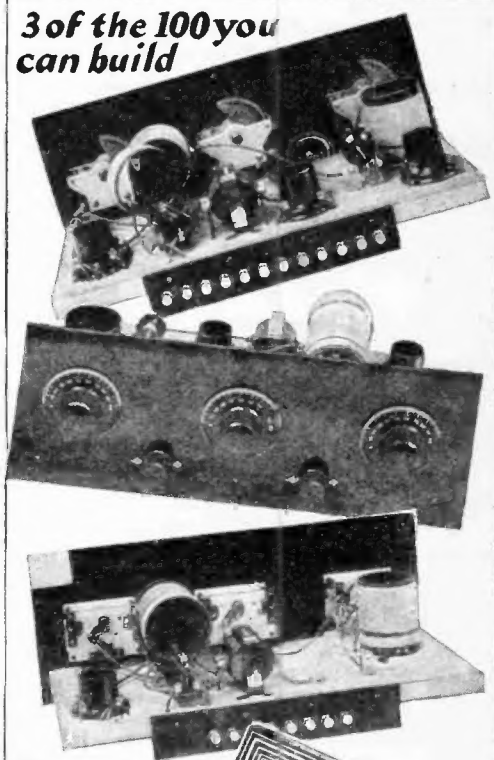
"Last week I had the pleasure of earning $110 servicing and selling Radio sets. I have made as high as $241 in two weeks. Before entering Radio I was making $35 a week. It is certainly great sport to do this kind of work.
J. A. Vaughn,
4202 Arsenal St.
St. Louis, Mo.

$450 a Month

"I work in what I believe to be the largest and best equipped Radio shop in the Southwest and also operate KGFI. I am averaging $450 a month."
Frank M. Jones,
922 Guadalupe St.
San Angelo, Tex.

You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



Find out quick about this practical way to big pay

Mail This FREE COUPON Today

J. E. SMITH, President
Dept. OCS, National Radio Institute
Washington, D. C.

Dear Mr. Smith: Kindly send me your big book, "Rich Rewards in Radio," giving information on the big-money opportunities in Radio and your practical method of teaching with six big Outfits. I understand this book is free, and that this places me under no obligation whatever.

Name..... *Age*.....

Address.....

City..... *State*.....

Occupation.....

Employment Service to all Graduates

Originators of Radio Home Study Training

IN THIS ISSUE..MARCH 1930

SCIENCE *and* INVENTION *Offers You*

PAGE

"Let There Be Light!" Said the Navy ... 974
An interesting frontispiece

Why Is Shipping Fog-Bound? ... 976
An editorial by Arthur H. Lynch

They Made Talkies at 100 Miles an Hour ... 979
A story about the cover picture

$400 for the Best Basement Conversion Plan ... 980
Announcing a SCIENCE AND INVENTION *contest*

A Needle's Shadow Showed Byrd the Pole ... 981
The Commander's wonderful sun compass

Shall We Fly by Rocket? ... 982
By our foremost rocket authority, Prof. Goddard

Cold Light in Perfect Form Found in Firefly ... 984
Dr. Lemkin hints at its significance to us

Curtiss "Tanager" Wins $100,000 Safety Prize ... 985
About the Guggenheim contest victor

Have a Basement Playroom ... 986
First article in the S. Gordon Taylor series

Ship and Shore Linked by Phone and Radio ... 990
Our radio editor's story of the initial success

Seagoing Power House Saves Tacoma ... 991
The navy defeats a Northwestern drouth

Radio Speaks From Clocks and Books ... 992
How to hide your set and have it too

Titanic Labors Bring World to Your Elbow ... 994
The making of a new encyclopedia

How Many Minutes Make a Mile? ... 995
Continuing Donald H. Menzel's tour through Relativity

Aladdin's Lamp in the Laundry ... 998
Mrs. Christine Frederick on the ins and outs of laundering

The Way I See It ... 1000
The editor illuminates (I hope) the scientific flux

Type Like Lightning ... 1001
Mary Jacobs describes a phrase-unit typing machine

Second Step in Training Glider Construction ... 1002
Lieut. Reynolds carries on with his instructions

Lindy Gets New Wings ... 1005
And a beautifully streamlined job it is, too

Awards Made in "Buzz-Saw" Contest ... 1006
$250.00 *given for the best solution of Dunninger's trick*

Build and Fly This Model "Bremen" Plane ... 1010
How to make the famous East-to-West ship in miniature

Make That Wet Cellar Dry ... 1013
Pertinent to the basement conversion plan contest

Sound Detecting Is Job for Real Sleuth ... 1015
Which tells you of noise and its tricky ways

450 Miles to the Gallon ... 1018
An article on gas economy which may astonish you

Patent Advice ... 1030
Joseph H. Kraus offers helpful counsel to inventors

Diagnosing Securities ... 1063
Our financial editor applies his test to these investment forms

Other Articles

General

In the Spotlight of Science. 988
Prepare to Welcome Feathered Friends ... 1004
Is It Going to Rain? ... 1007
The Safety Valve ... 1016
Let's Laugh ... 1022
The Oracle ... 1024
Yankee Brains at Work ... 1028

Automotive

Jumping Motor-cars ... 1008
Motor Hints ... 1014
Do You Know Your Cars? 1032

Aviation

What's New in the Air? .. 996

Amusement and Experiment

Build Your Own Tilt-Top Table ... 999
Magic ... 1009
Have Some Fun With Cold Light ... 1012
Toy Figures Come to Life .. 1019
Wrinkles and Recipes ... 1020
Brain Teasers ... 1026

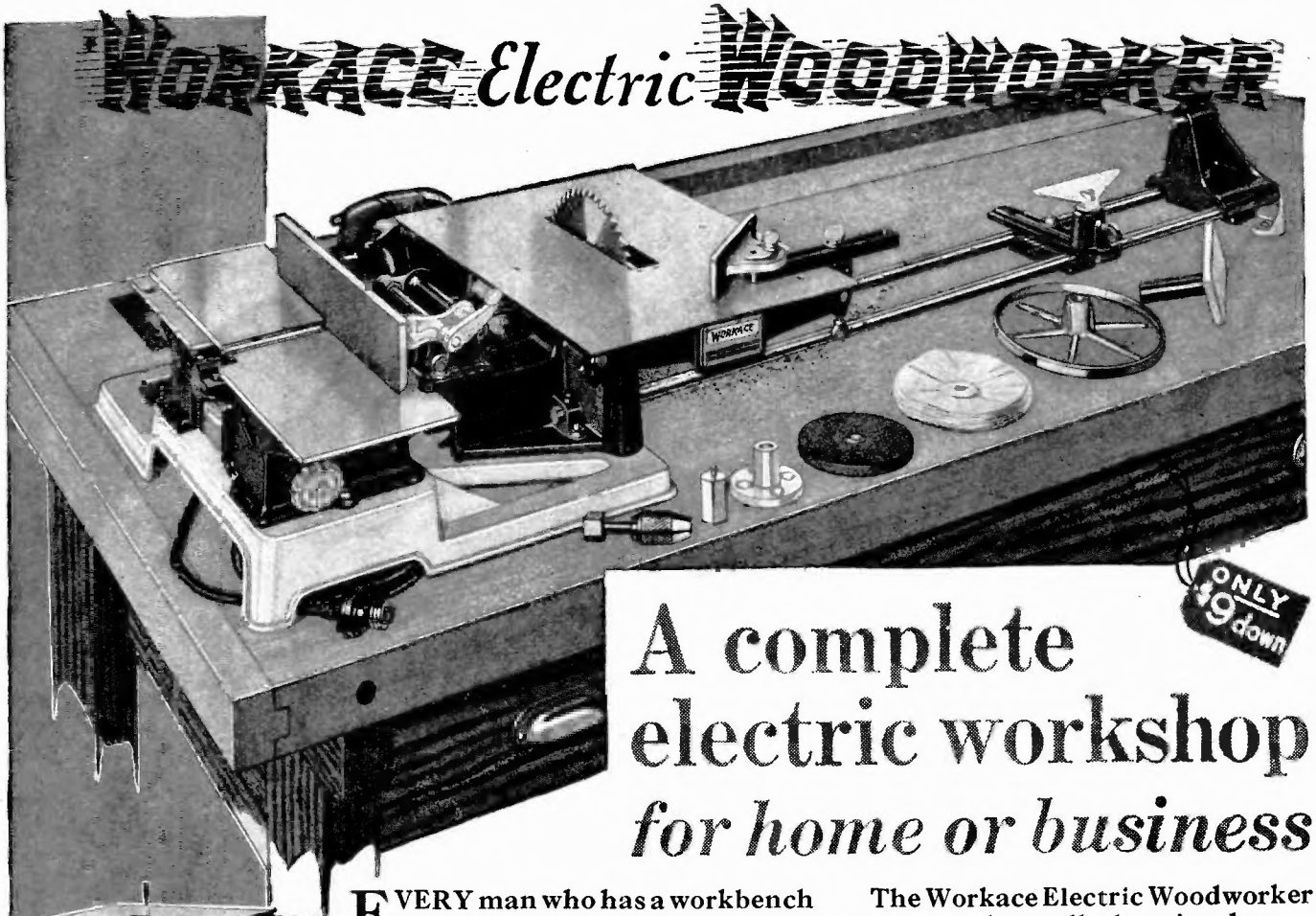
VOL. XVII | Whole Number 203 | March, 1930, Number 11

SCIENCE AND INVENTION. Published monthly by Experimenter Publications, Inc., at 184-10 Jamaica Ave., Jamaica, N. Y. Entered as second class matter, at the Post Office at Jamaica, N. Y., under the Act of March 3, 1879. Title registered at the U. S. Patent Office.

Copyright, 1930, by Experimenter Publications, Inc. The contents of this magazine must not be reproduced without giving full credit to the publication.

Subscriptions: $2.50 per year in U. S. and possessions; Canada and foreign countries, $3.00 a year. Experimenter Publications, Inc. Executive and Editorial Offices, 381 Fourth Avenue, New York City, N. Y.

WORKACE Electric WOODWORKER



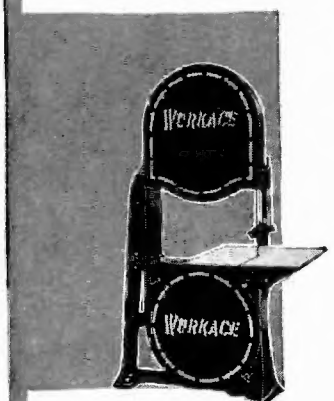
A complete electric workshop *for home or business*

EVERY man who has a workbench has often wished for a complete outfit of power driven woodworking machinery. Such a workshop is now as easy to possess as a radio set, and costs much less.

The Workace Electric Woodworker—a complete all-electric shop—costs but $9.00 first payment and $9.00 a month. This includes power driven tools for every woodworking operation.

Jig Saw Attachment for the Workace Electric Woodworker..... $10

Low Price $89 *Easy Terms*



14" Workace Band Saw, fast, accurate, economical $75

Here's a hobby that gives you relaxation from everyday cares—bringing pleasure and profit. Thousands of men and boys have adopted the Workace hobby. Make hundreds of things with the Workace Electric Woodworker. Under the magic of the whirring saw, planer, lathe, sander, drill, grinder and buffing wheel (all are included in the Workace Woodworker), raw lumber is easily converted into furniture, household necessities and countless other articles. Work out your own ideas with your own complete electric workshop. There's no better gift for the growing boy than Workace. It provides a wholesome man-building outlet for his energy and enthusiasm.

includes all this:

- 4" Planer
- 8" Circular Saw
- 6" x 36" Lathe
- 8" Disc Sander
- 6" Buffing Wheel
- 5" Emery Grinder
- ¼" Drill Chuck
- ¼ H. P. G. E. Motor, 110-Volt, A. C., 60 Cycle

Endless V-Belt, two 4" and one 2½" V-Belt, Pulleys, Cast Iron Sub Base and 10 ft. Cable with separable Plug.

The Planer and Circular Saws are each complete units and may be purchased separately at the correspondingly low price of $25.00 each.

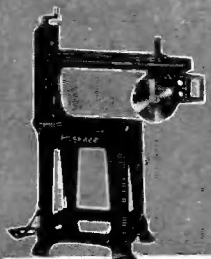
A down payment of $9.00 brings you the complete Workace All-Electric Woodworker ready to set up and use right away. The entire transaction is handled by one of your local hardware stores so that you will know the man you are dealing with and get his service and cooperation.

The Wallace Guarantee assures replacement of defective parts.

Large reproduction

For every coupon mailed in we will send a large picture of the entire outfit and a complete description of each item.

Send for full particulars and we will refer you to our dealer who is nearest to you.



Workace Radial Saw, sets at any angle $140
Cast Iron Table $10 Extra
Cast Iron Legs $15 Extra

Workace high speed, direct drive, portable Electric Shaper..... $95

MAIL THE COUPON TODAY

J. D. WALLACE & COMPANY,
California Ave. at Wilcox St., Chicago
11 West 42nd Street, New York City
268 Market Street, San Francisco

Please send me large size photograph and particulars about the Workace Electric Woodworker. Also interested in ☐ Jig Saw— ☐ Band Saw — ☐ Radial Saw — ☐ Shaper — ☐ Planer.

Name.....

Firm.....

Address.....

Consult telephone directory for branch addresses in other cities

R. T. I. R. T. I. QUALIFIES YOU TO MAKE MONEY AND ITS SERVICE KEEPS YOU UP-TO-THE-MINUTE ON THE NEWEST DEVELOPMENTS IN RADIO, TELEVISION, AND TALKING PICTURES **R. T. I.**

RADIO TELEVISION-TALKING PICTURES

BIG MONEY NOW!

More to Come

TUNE IN ON R-T-I

Radio now offers ambitious men the greatest Money-Making Opportunity the world has ever seen! Hundreds of trained service men are needed by radio dealers, jobbers, and manufacturers!

GOOD JOBS are open for men in all of the many branches of Radio, where qualified men easily earn $60 to $100 per week and even $10,000 a year jobs are plentiful.

BIG MONEY for Spare-Time Radio Work is easily made in every city and village. You can now qualify for this Big-Money work quickly through R. T. I. Get the Big Money Now and go up and up in this Big Pay field. The Radio industry calls for More Men, and R. T. I. supplies what the industry wants you to know.

Supervised by Radio Leaders

R. T. I. training is prepared and supervised by prominent men in radio, television and talking picture engineering; distributing; sales; manufacturing; broadcasting, etc. These men know what you must know to make money in Radio. You learn easily in spare time at home with the R. T. I. wonderful combination of Testing Outfits, Parts, Work Sheets, Job Tickets. It is easy, quick and practical, covers everything in Radio—includes Talking Pictures and the latest in Television. Get started in Big Money Radio work now.

$60-$70-$80-PER WEEK AND UP. That's what R. T. I. training leads to. Send for the R. T. I. Book and see for yourself.

No Experience Needed

ALL YOU NEED is ambition and the ability to read and write. The Radio industry needs practical trained men. Remember, R. T. I. makes it easy to earn spare time money while you learn at home.

More to come

THE MEN who get into this Big-Money field now will have an unlimited future. Why? Because this billion dollar Radio industry is only a few years old and is growing by leaps and bounds. Get in and grow with it. $10 to $25 per week and more is easily made in spare hours while you are preparing for Big Money. TELEVISION, too, will soon be on the market, so the leaders say. Be ready for this amazing new money-making field. Remember, R. T. I. "3 in 1" home-training gives you all the developments in Television and Talking Picture Equipment, together with the complete Radio Training.

Warning

Do not start R. T. I. training if you are going to be satisfied to make $15 or $20 per week more than you are now. Most R. T. I. men will make that much increase after a few weeks. There is no reason to stop short of the Big Money Jobs or the Big Profits in a spare time or full time business of your own. No capital needed. Get started with R. T. I. now. Make money while you learn at home.

R. T. I. Book Now FREE

The thrilling story of Radio, Television and Talking Pictures is told with hundreds of pictures and facts — its hundreds of big money jobs and spare time money-making opportunities everywhere. Send for your copy now. USE THE COUPON.

LET F. H. SCHNELL AND R. T. I. ADVISORY BOARD HELP YOU

Mr. Schnell, Chief of the R. T. I. Staff, is one of the ablest and best known radio men in America. He has twenty years of Radio experience. First to establish two-way amateur communication with Europe.

• Former traffic manager of American Radio Relay League. Lieutenant Commander of the U. S. N. R. Inventor and designer of Radio apparatus. Consultant Engineer to large Radio manufacturers.

Assisting him is the R. T. I. Advisory Board composed of men prominent in the Radio industry.

THE R. T. I. ADVISORY BOARD. These men are executives with important concerns in the radio industry—manufacturing, sales, service, broadcasting, engineering, etc., etc. They supervise R. T. I. Work Sheets, Job Tickets, and other training methods.

R. T. I. R. T. I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN

RADIO & TELEVISION INSTITUTE
Dept. 913, 4806 St. Anthony Ct., Chicago

RADIO & TELEVISION INSTITUTE
Dept. 913, 4806 St. Anthony Court, Chicago

Send me Free and prepaid your BIG BOOK "Tune In On Big Pay" and full details of your three-in-one Home Training (without obligating me in any way).

Name.....

Address.....

City..... State.....

Greatest ENCYCLOPAEDIA VALUE

ever offered the American People

. . . . Completely New

Encyclopaedia Britannica

$45 BOOKCASE INCLUDED
This handsome bookcase table, made of genuine Brown Mahogany, is included with every set of the new Britannica except in the Special Library form.

EVERY FAMILY, every wide-awake man or woman, can now own this newest, finest Encyclopaedia Britannica! Mass production on a scale never before possible brings you this superb 14th Edition at a *new low price*—the lowest at which any completely new Britannica has been offered in more than 60 years!

Never before in the history of encyclopaedia publishing has such an opportunity been given American readers.

More For Your Money A $2,000,000 Work

When you buy the *new* Encyclopaedia Britannica you buy sound built-in value that is little short of amazing. Nearly three years of intensive editorial effort, the best work of 3,500 world-famous contributors, the expenditure of $2,000,000, these are highlights in the preparation of this superb 14th Edition.

At the present low price the *new* Britannica represents greater value for your money than any other book published.

You get the equivalent of 500 ordinary books in the text matter alone—and at one-tenth their cost. Here is literally the sum total of human knowledge in 24 compact readable volumes!

You get the varied richness of 15,000 illustrations—paintings, photographs, maps and drawings, a unique gallery of art, science and mechanics, worth many times the cost of the books. Full page halftones, color plates and sumptuous gold tones make vivid every section of the *new* Britannica.

You get the writings of 3,500 authorities—of men and women whose services only the world-wide prestige of the Britannica could command. Here is authority, accuracy, fresh interpretation direct from the best minds of the century.

You get up-to-date knowledge—the time proven learning of the past, the latest discoveries of today, the promised progress of tomorrow. New facts, clearly interpreted, give freshness and interest to every paragraph.

You get a wealth of practical information for every member of the family. It answers every "what," "who," "why" and "when." But it also answers ten thousand "hows." It is the finest guide to *doing things* ever published.

You get, in short, what critics have called "the finest encyclopaedia in English"—a book that brings you fully half again as much material as any other encyclopaedia or general reference work published today.

For every American home the *new* Britannica with handsome bookcase table, its superb bindings, its wide range of help for work and play, is a center of interest for every member of the family.

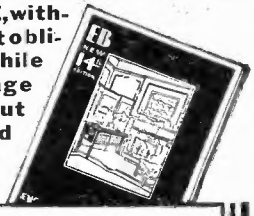
SPECIAL OFFER—*only* $5 DOWN

Large scale production makes possible the present amazingly low price. A genuine mahogany bookcase is included with each set, and a deposit of only $5 brings the 24 volumes and table to your home. Balance may be paid in convenient monthly payments.

Send For Free Booklet

Send for the handsome new 56-page booklet containing numerous color plates, maps, etc., from the new edition and giving full information about it, together with details of bindings, low prices and easy payment plan.

You needn't risk a cent. The booklet is yours FREE, without the slightest obligation. Now—while you have this page at hand—tear out the coupon and send it in.



ENCYCLOPAEDIA BRITANNICA, Inc.
342 Madison Ave., New York City S.I. 3-E2

Please send me by return mail, without any obligation on my part, your 56-page illustrated booklet describing the *new* Britannica together with low price offer, etc.

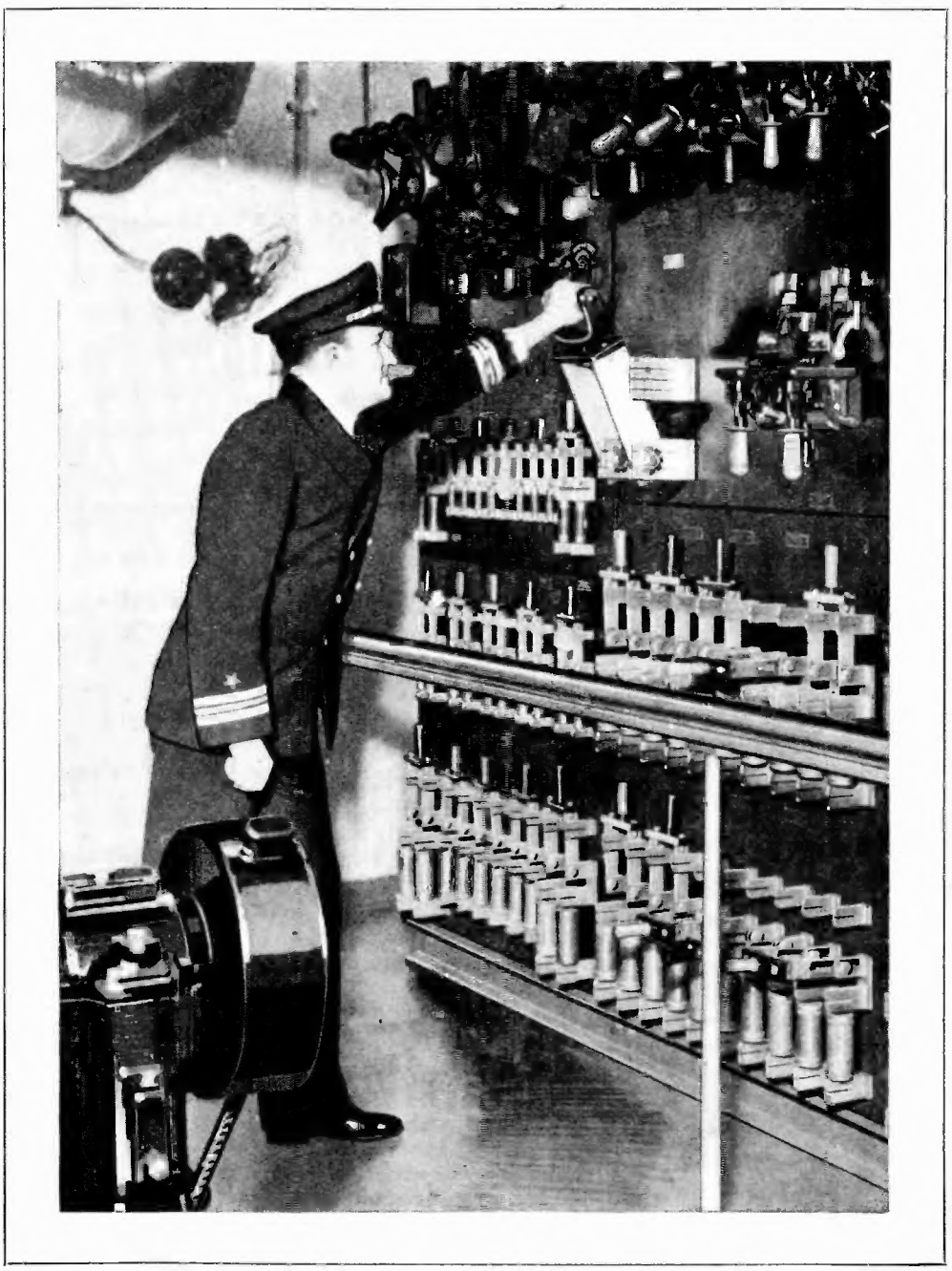
Name_____

Address_____

City_____ State_____

SEND FOR FREE BOOKLET TODAY

"Let There Be Light!" — said the Navy



Lieut. Comdr. H. L. White, Chief Engineer of the U. S. S. Lexington, closed the switch which turned the 20,000 kilowatt output of the U. S. S. Lexington's generators into the power lines of the city of Tacoma. At the instant of contact, the city's power shortage, caused by the depletion through drouth of municipal hydroelectric reservoirs, was brought to an end, and the threatened industrial suspension averted.

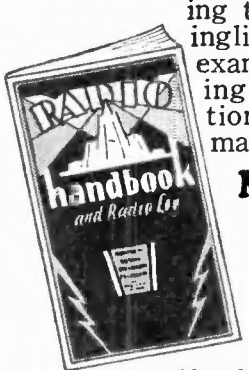
4 of the 40 Easy Ways to Make $3.00 an Hour In Your Spare Time in RADIO

THE four plans shown are but a sample of the many ways in which our members are making $3.00 an hour upwards, spare time and full time, *from the day they join the Association.* If you want to get into Radio, have a business of your own, make $50 to $75 weekly in your spare time, investigate the opportunities offered the inexperienced, ambitious man by the Association.

Our Members Earning Thousands of Dollars Every Week

The Association assists men to cash in on Radio. It makes past experience unnecessary. As a member of the Association you are trained in a quick, easy, practical way to install, service, repair, build and rebuild sets—given sure-fire money-making plans developed by us—helped to secure a position by our Employment Department. You earn while you learn, while you prepare yourself for a big-pay Radio position.

The Association will enable you to buy parts at wholesale, start in business without capital, help you get your share of the $600,000,000 spent annually for Radio. As a result of the Association, men all over the country are opening stores, increasing their pay, passing licensed operator examinations, landing big-pay positions with Radio makers.



REDUCE STATIC BY MARVELOUS METHOD
WIRE EVERY ROOM FOR RADIO RECEPTION
IMPROVE TONE AND VOLUME OF OLD SETS
RADIO-FY & ELECTRIFY PHONOGRAPHS

Mail Coupon Today for the FREE HANDBOOK

It is not only chock-full of absorbing information about Radio, but it shows you how easily you can increase your income in your spare time. Mailing the coupon can mean $50 to $75 a week more for you.

Radio Training Association of America
4513 Ravenswood Avenue Dept. RN-3, Chicago, Illinois

Below are a few of the reports from those now cashing in on the "40 Easy Ways"

Clears $3,000.00 Frank J. Deutch, Pa.—"Since joining the Association I have cleared nearly $3,000.00. It is almost impossible for a young fellow to fail, no matter how little education he has, if he will follow your easy ways of making money."

$1,100.00 in 6 Weeks J. R. Allen, Calif. — "Have done over $1,100.00 worth of business in the last 6 weeks. Next month I am going to open up a store of my own. I never knew that money could come so fast and easy."

$25.00 a Week Spare Time N. J. Friedrich, N. Y.—"I have averaged $25.00 a week for the last 7 months even though I am not a graduate but just learning."

Training Lands Him Job R. C. Kirk, N. C.—"Your training has been very valuable to me. I landed a job with the big department store out here a few weeks ago because I had my membership card with me. There were a large bunch of applications ahead of me."

ACT NOW
If You Wish NO-COST Membership

For a limited time we will give to the ambitious man a No-Cost Membership which need not—should not—cost you a cent. For the sake of making more money now, and having a better position in the future, mail coupon below *now.* You'll always be glad you did.

Radio Training Association of America
Dept. RN-3; 4513 Ravenswood Ave., Chicago, Ill.

Gentlemen: Please send me by return mail full details of your Special No-Cost Membership Plan, and also a copy of your Radio Handbook.

Name .....

Address .....

City ..... *State* .....

MARCH. 1930
NUMBER 11

Science and Invention

VOLUME XVII
WHOLE NO. 203

Published by Experimenter Publications, Inc., 381 Fourth Ave., New York City, N. Y.

B. A. Mackinnon
President

H. K. Fly
Vice-President

Arthur H. Lynch, EDITORIAL DIRECTOR

MURRAY GODWIN
Managing Editor

JOSEPH H. KRAUS
Field Editor

T. O'CONOR SLOANE, Ph.D.
Associate Editor

ALFRED M. CADDELL
Financial Editor

AUGUSTUS POST
Aviation Editor

GEORGE R. BROWN
Radio Editor

Editorial

Why Is Shipping "FOG-BOUND"?

EVERY now and then we are agreeably apprised of some additional practical use being made of scientific achievements. At frequent intervals the products of the laboratory step forth into the field of service. The results of chemical experiments, observed by vigilant chemists, appear in your automobile, in your home, on the streets of your city. They constitute the basis of new metal alloys, new kinds of furniture, new clothing, new living conditions.

In numerous industries, we find a progressively widening application of ultra-violet rays and X-rays. "King Ultra," as the invisible violet rays are called, is able to detect the quality of diamonds, and to ascertain the genuineness of many other things; to cause as much fading in textiles or paints within fifteen minutes as could be achieved by sunlight in six months.

In other branches of industry we also find the photoelectric cell—science's latest eye—investigating chemical and manufacturing processes, detecting low quality and flaws in goods ranging from cigars to yeast cakes.

In the infra-red, or radio, field we find practicability following swiftly in the footsteps of laboratory developments. The police departments of certain progressive cities use radio to nip crime in the bud. Railroads are installing radio-controlled signalling systems, are developing radiophone communication for train operation and passenger use. The geologist is using radio to detect and explore mineral veins in the earth. Aircraft are becoming more and more dependent upon development of this art.

Of startling contrast to the utilization of scientific progress in these industries, however, is the obvious and all-too-perilous indifference shown toward scientific developments by harbor authorities and shipping interests. Marine navigation is thousands of years old, but ships and mariners are just as effectively crippled by fog as they were in the days of the Phoenicians. For days at a time tramp steamers and ocean liners alike have been compelled to lie at anchor outside harbor entrances, fearful of attempting to nose their way to their piers. In December, the harbor of New York was completely fog-bound for a period of approximately five days. During that time a very serious accident occurred—the steamship *"Algonquin"* rammed and sunk the *"Fort Victoria,"* Bermuda-bound with several hundred passengers, and at this writing the upturned hulk remains lying in the channel, a menace to other craft. Fortunately, one agency of science was available—the *"Fort Victoria,"* compelled by law to carry radio apparatus, was able to summon aid to rescue its several hundred passengers in the minutes before it turned over and sank.

But has every possibly step been taken to insure safe navigation in our harbors?

Several years ago some "direction-finding" experiments were conducted by the United States Navy in New York harbor. An electric cable was laid in the harbor channel. One end of it was insulated; the other end made contact with the water or ground. From this cable there emanated a 60-cycle hum, or impulse. Coils were mounted on the port and starboard sides of the test ship and connected in series with amplifiers and a telephone head set. When the vessel was traveling directly above this cable the hum was heard with equal strength in each of the earphones, but if the skipper deviated from his course ever so little, the deviation was at once made apparent by the "off-center" quality of the hum. These tests proved quite successful, and inquiries made of New York port authorities and naval authorities fail to elicit the reason why such an auspicious start toward successful harbor navigation was not followed up and made practical for all ships entering this port.

And aside from this submerged cable system, has any attempt been made to adapt to marine work the radio beacon developed for aviation? Has the fathometer, or radio echo device, ever been tried in harbor location finding? Have the numerous buoys which mark the channel been experimented with? Could not low power radio waves be employed to carry distinctive beat notes to and from buoys and to and from ships?

In our opinion, the money lost through the *"Fort Victoria"* disaster alone would have sufficed to equip numbers of ships with direction-finding and course-directing equipment which would make such disasters impossible. If the shipping interests and port authorities are not interested in this very important fact, marine insurance companies should be.

Arthur H. Lynch

"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact" - - - - - HUXLEY

Pledge to the Public on Used Car Sales

1 Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.

2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.

3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

© 1928 The Studebaker Corporation of America

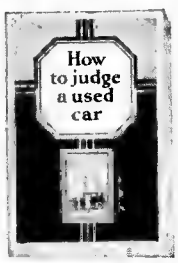
Buy where *used* cars are sold like *new* cars···

on the STUDEBAKER PLEDGE PLAN

NOWHERE in the used car market will you find a fairer, squarer basis for used car sales than the famous Studebaker Pledge Plan. More than 150,000 people, appreciating this fact, bought Pledge-backed used cars last year.

When you buy a Pledge-backed used car, you invest in unused transportation. Most cars sold on this plan have been repainted, refinished and reconditioned to look and perform as well as they did when new.

Under the terms of the Studebaker Pledge, you get five days' driving trial to determine for yourself whether or not the used car you select is suited to your needs. On all Certified cars, the Pledge provides a 30-day guarantee for free adjustments and replacement of defective parts. And all Pledge-backed used cars carry plainly marked price tags—one price to every buyer! Your Studebaker dealer can show and demonstrate Studebakers, Erskines and other makes of cars in a variety of models. You will find the type of motor car you want—and the kind of protection for your purchase that your business sense demands.



Invest 2c—you may save $200

Mail the coupon below for the free booklet. A 2c stamp is an investment which may save you as much as $200 in buying a motor car!

THE STUDEBAKER CORPORATION OF AMERICA
Div. 173, South Bend, Indiana
Please send me copy of "How to Judge a Used Car"

Name.....

Street.....

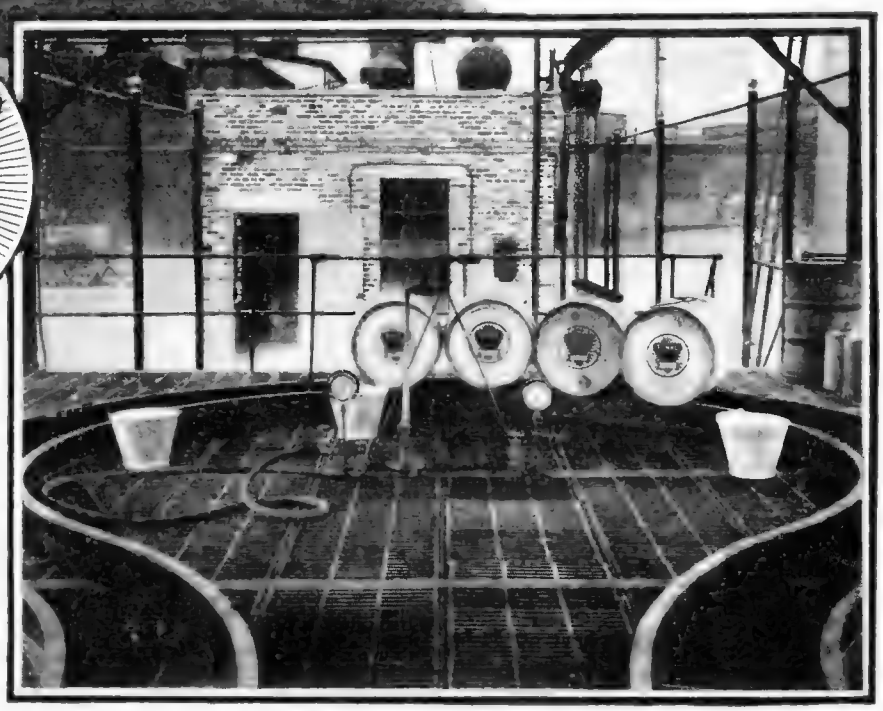
City..... *State*.....

STUDEBAKER

Builder of Champions

Left—Typical refinery scene with Ethyl mixing plant in foreground.

Below—Close-up of Ethyl mixing plant. Drums on runway contain Ethyl fluid about to be mixed with gasoline to form Ethyl Gasoline.



WITH ETHYL (TRADE MARK REG. U.S. PAT. OFF.) BRAND OF ANTI-KNOCK COMPOUND — ETHYL GASOLINE CORPORATION, NEW YORK, U.S.A. — Knocks out that "knock"

Wherever you drive—whatever the oil company's name or brand associated with it—*any* pump bearing the Ethyl emblem represents quality gasoline of anti-knock rating sufficiently high to "knock out that 'knock'" in cars of average compression and bring out the additional power of the new high-compression cars.

How Ethyl Fluid is mixed with gasoline

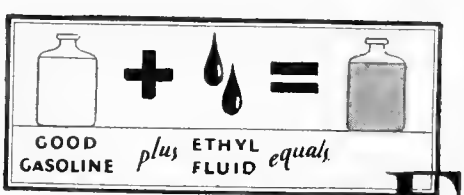
ANYONE interested in practical chemistry would enjoy a visit to one of the plants in which the oil companies mix Ethyl fluid containing tetraethyl lead with their gasoline to form Ethyl Gasoline.

What would probably be most impressive would be the *precision* with which it is done. Engineers from the oil company or from the Ethyl Gasoline Corporation supervise every step of the process.

First, the base gasoline with which Ethyl fluid is to be mixed is tested at an Ethyl laboratory. From this test, the exact amount of Ethyl fluid necessary to bring the gasoline up to a rigid standard of anti-knock quality is determined. An accurate measuring device is used at each refinery to insure that this quantity of Ethyl fluid goes into every gallon of gasoline.

Look for the Ethyl emblem.

Ethyl Gasoline Corporation, New York City.



The active ingredient now used in Ethyl fluid is tetraethyl lead.

© E. G. C. 1930

ETHYL GASOLINE

They Made Talkies *at* 100 Miles *an* Hour!

Precariously perched behind cameras and sound-recording equipment, Director Sutherland hung on for several laps of the course.

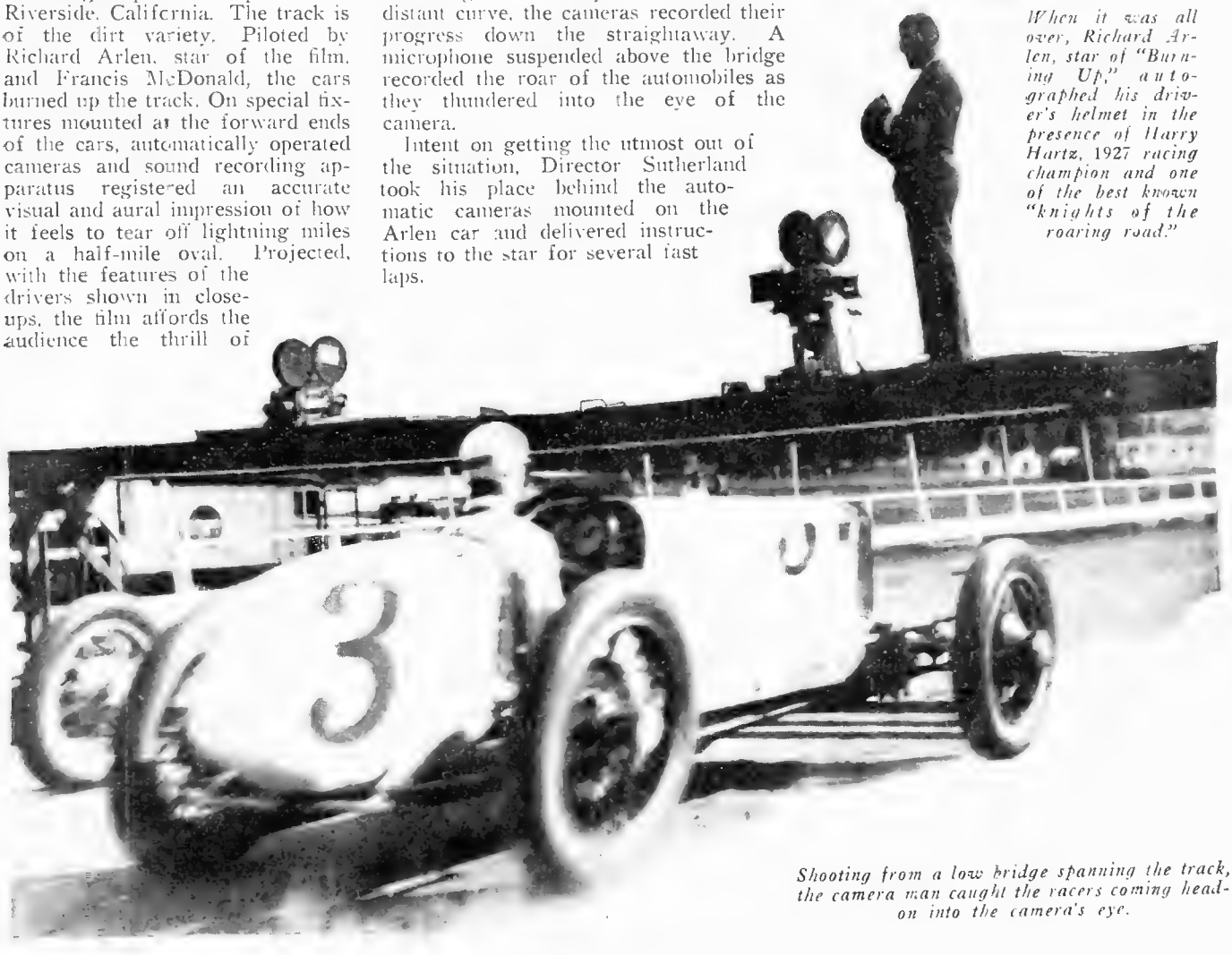
MANY a motion picture thriller has been filmed of the "knights of the roaring road." But it remained for the talkies to sound-film a pilot of the racing track from the head-end of his machine—and at a speed of 100 miles an hour!

The film appropriately is named "Burning Up." The place was Riverside, California. The track is of the dirt variety. Piloted by Richard Arlen, star of the film, and Francis McDonald, the cars burned up the track. On special fixtures mounted at the forward ends of the cars, automatically operated cameras and sound recording apparatus registered an accurate visual and aural impression of how it feels to tear off lightning miles on a half-mile oval. Projected, with the features of the drivers shown in close-ups, the film affords the audience the thrill of race driving carried out with a realism extraordinary on the screen.

Another thrill for the film was achieved through motion- and sound-shots made from a bridge spanning the track. The clearance between track and bridge was merely sufficient to permit the squat racing machines to get under it by inches. Picking up the oncoming cars as they skidded around a distant curve, the cameras recorded their progress down the straightaway. A microphone suspended above the bridge recorded the roar of the automobiles as they thundered into the eye of the camera.

Intent on getting the utmost out of the situation, Director Sutherland took his place behind the automatic cameras mounted on the Arlen car and delivered instructions to the star for several fast laps.

When it was all over, Richard Arlen, star of "Burning Up," autographed his driver's helmet in the presence of Harry Hartz, 1927 racing champion and one of the best known "knights of the roaring road."



Shooting from a low bridge spanning the track, the camera man caught the racers coming head-on into the camera's eye.

SCIENCE *and* INVENTION OFFERS $400

for the Best Answer to the Question

"How Can We Best Utilize Waste Basement Space?"

1st prize	$100.00	3rd prize	$40.00
2nd prize	$60.00	5 prizes of	$20.00
		10 prizes of	$10.00

In the average home only about 25% of the basement floor area serves really useful purposes. With proper thought and treatment the other 75% may be converted into one or more rooms equal to the upstairs rooms in comfort and attractiveness, for entertainment, playroom, den, shop, or other purposes. To explore the possibilities of the livable basement, SCIENCE AND INVENTION is offering $400.00 for practical ideas from readers.

IN this SCIENCE AND INVENTION basement plan competition there are no restrictive requirements. Any reader may enter, and he may submit as many separate plans as he desires, although not more than one prize will be awarded to a single individual.

All you need to do is write a letter not exceeding 1,000 words, containing your plan for utilizing the waste space in any basement — existing, imaginary, or proposed. Or, if you or one of your friends has a basement in which the space has been utilized in an interesting and practical manner, your letter may describe this. If you submit more than one plan, make each the subject of a separate letter.

A drawing will aid the jury to understand your idea. Make a rough sketch showing approximate dimensions of the basement, location of doors, windows, permanent equipment, etc. If you plan remodeling an existing basement, it will help the jury if you provide two drawings, one showing the existing and the other the proposed layout.

In the latter case it will help if you divide your letter into three parts. In the first describe the existing basement and the problems involved. In the second describe the changes you propose. In the third discuss the materials and methods you propose—wall, floor and ceiling treatments; kind, location, and purpose of partitions, if any; provisions for dampproofing, heating, ventilation, lighting, equipment, etc.

If you describe a basement already remodeled, you may limit your letter to the basement as it stands, including materials, methods, and equipment employed in making it comfortable and attractive. A photograph will help.

If you describe a basement such as you would want in your own home, explain the purposes for which you would use the space, and the provisions and materials you would employ to make it dry, comfortable, and attractive; also the equipment you propose to install.

Should you feel that you lack sufficient knowledge of the materials and equipment needed for your plans, you can obtain it from literature which manufacturers will be glad to send you. A list of literature will be published in the April issue of SCIENCE AND INVENTION, together with a convenient coupon. Simply fill in the coupon and forward it to SCIENCE AND INVENTION. The literature will be mailed to you without charge.

Other fruitful sources of information are Mr. Taylor's article, "The Basement Playroom" and Josef W. Von Stein's "Make that Wet Cellar Dry," which appear in the present issue.

It is desirable that your letter be typewritten. However, this is not essential. Your letter should occupy only one side of each sheet. Your name and address should appear on each sheet.

The jury will select as the winning plans those which are *best* from the standpoint of *comfort, attractiveness,* and *ingenuity of arrangement,* allotting them prizes in the order of their merit. But it must be understood that a plan, to be considered on these grounds, must *first of all be capable of being worked out in practice.*

The decision of the jury will be final. In case of a tie, the full amount of the award involved will be given each tieing contestant.

The competition opens with this announcement and will close on May 31, 1930. All entries, to be eligible, must be received by SCIENCE AND INVENTION, at 381 4th Ave., New York, before midnight, May 31, 1930.

The prize winners will be notified within approximately two weeks after the closing date. Their names will also be announced in the September issue of SCIENCE AND INVENTION.

SCIENCE AND INVENTION cannot undertake to return the letters submitted by contestants. It is suggested that duplicate copies be retained by readers who desire them.

SCIENCE AND INVENTION reserves the privilege of publishing any idea submitted. Entries thus published will upon publication be paid for at the rate of $5.00 each, if they have not been awarded regular prizes.

The prize winners will be selected by a jury of three outside specialists. This jury will be composed of:

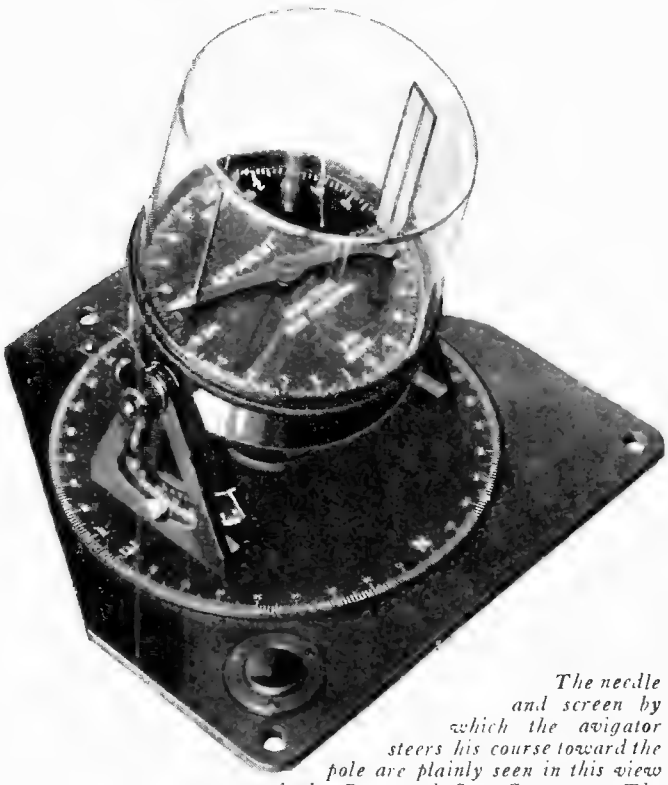
LELAND HUBBELL LYON, A.I.A., of the New York architectural firm of Lyon & Taylor, an authority on home design.

LOUIS C. STONE, Editor of BUILDING INVESTMENT MAGAZINE, a practical builder of homes, and a specialist in home building materials and equipment.

S. GORDON TAYLOR, Research Director of Taylor, Rogers & Bliss, Merchandising Consultants in the building field, and author of the article "Have a Basement Playroom," in this issue.

A Needle's Shadow Showed Byrd *the* Pole

As He Soared Across the Waste of Antarctic Ice and Snow, Commander Byrd Kept His Course True With a Wonderful Sun Compass Designed Especially for Polar Avigation.



The needle and screen by which the avigator steers his course toward the pole are plainly seen in this view of the Bumstead Sun Compass. The clock face rests on a mat of India rubber sponge, so that it can be leveled by hand pressure.

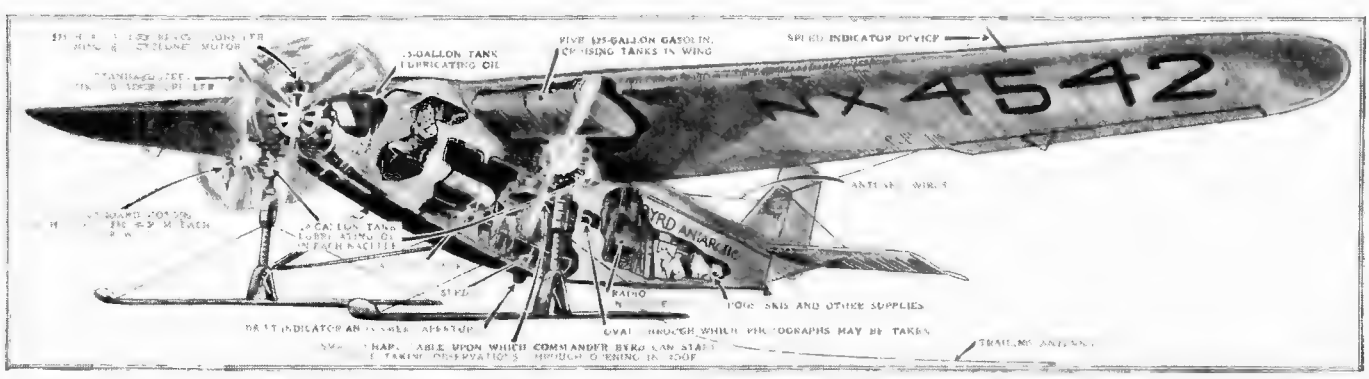
ALL the world knows that Commander Richard Byrd has added the conquest of the South Pole to his conquest of the North. But most of the world remains in the dark regarding the instrument that guided him to that minute geographic spot. For the quest demanded a special instrument, and not until our day has that special instrument been designed. It is the Bumstead Sun Compass.

The Bumstead Sun Compass is a substitute for the ordinary mariner's compass especially designed for polar work. At the north and south poles of the earth there are two other poles, the magnetic ones. Over one of these, the magnetic needle tends to take a vertical position, so that it possesses no north or south directional power, for in the vicinity of the magnetic poles there is very little directional influence exerted on the needle. If the magnetic poles were obliging enough to be located exactly at the geographical poles, the dipping needle might be of help in locating the latter; but as things are, when a magnetic pole is located, the explorer has to go further to reach the geographical pole, and his compass is useless.

The design of the Bumstead Sun Compass is based on the apparent motion of the sun around the earth. If the cut is referred to, its construction is easily understood. The upper dial, across which lies a clock hand, is divided into 24 primary divisions representing 24 hours. The case surmounted by this disc contains a clock which moves the hand around the dial once in 24 hours. On one end of the hand there is a vertical stylus; on the other end there is a vertical translucent screen. The apparent plane of the sun's rotation varies from day to day, and coincides approximately with the equator only twice in the year—at the equinoxes.

Now suppose the clock is going. Having determined by navigational astronomy the inclination of the apparent plane of the sun's revolution to the elliptic, the operator sets the clock to that angle. If the hand is then set to point at the figure of the hour of the day, and the compass is set so that the shadow of the stylus falls directly in the center of the screen, noon and midnight figures will lie north and south. The avigator steers a course which keeps the shadow of the stylus in the center of the screen, changing at very short intervals the angle of inclination of the clock face, so as to keep it in parallelism with the apparent path of the sun. By keeping this path he will pass directly over the pole, north or south as the case may be. The success of his venture, however, depends on the visibility of the sun, for if clouds conceal this from him his compass becomes useless.

And now the question comes of how the avigator is to know when he reaches the pole. This he will have to determine by dead reckoning and observation of the altitude. Knowing how fast his plane is going, and the distance of his starting point from the pole, he can apply these data to the path which his sun compass has given him, and determine approximately when he arrives above the pole. To confirm it, he must take some altitudes with a sextant. This Admiral Byrd did very fully in crossing the North Pole, and his observations were confirmed by calculations made in Washington, showing wonderfully accurate results on his part. For the definite determination of the location of the pole these altitude observations are absolutely essential.

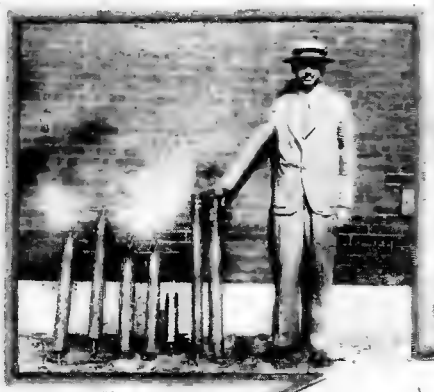


Precisely fitted for the flight toward the pole was the all-metal cantilever monoplane used by the Byrd expedition.

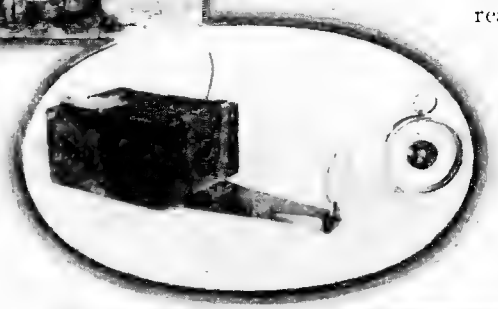
Passengers, fuel and a parachute are provided for in a rocket planned by Professor Robert Oberth, of Germany, a model of which finds place in the UFA film, "The Girl in the Moon." Professor Oberth was awarded a prize by the French government for advancement in aeronautics.

Shall

Liquid Propellant Rocket Will Make Earth-to-Moon Flight Possible, Says Dr. Goddard



With these liquid propellant rockets Dr. Goddard has conducted many experiments at Clark University. A rocket of this type may ultimately reach the moon!



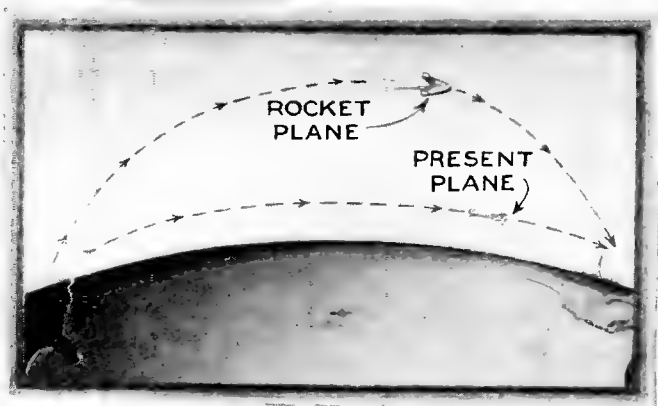
A special camera and barometer were attached to Professor Goddard's rockets to record the actual altitude reached at the limit of their flight. Parachutes enabled them to land without harm to the instruments.

WHAT may be expected of the new rocket-propulsion scheme for aircraft?" If one limits the question to include only those planes already equipped with rockets, or bundles of rockets, the answer is *nothing*. If, however, the question includes the adaptation of my liquid-propelled rocket to airplanes, the answer may well be *everything*.

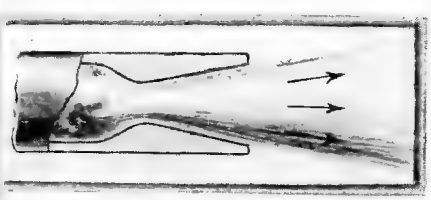
First, the question arises as to whether or not rockets will supplant the present gasoline and Diesel engines for propelling aircraft. Black powder rockets, such as have been used in the recent rocket flights in Germany, cannot supplant present engines. Even hundreds of tons of such rockets would not be sufficient to send a small craft across the Atlantic. This is quite obvious to all trained engineers and has, I believe, prejudiced them against the whole rocket problem, and possibly retarded the development of the rocket's real contribution to human progress—that of the use of liquid propellants for rapid transportation.

Today, if a rocket were to consist of a large proportion of liquid propellant material of greater heat energy per pound than powder, and this were burned efficiently, that is, if most of the heat energy of the material were converted into energy of motion of the ejected gases, then very great distances could be covered with a rocket of moderate size.

Most engineers do not yet realize that a rocket consisting chiefly of liquid propellant can be very efficient. The rocket usually considered is the black powder

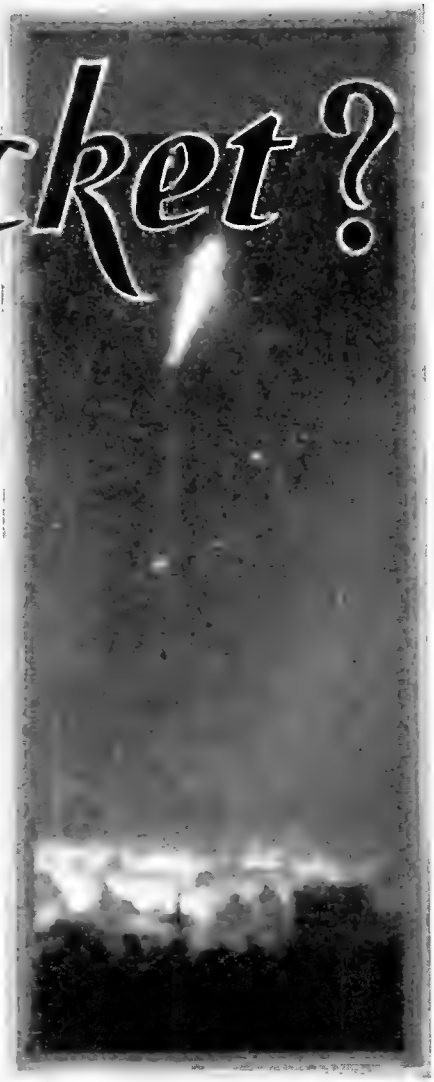


The nature of the rocket plane would enable it to fly at an altitude of slight atmospheric resistance.



Hurled through the air by the reaction of expanding gases, the rocket reaches a flying efficiency far higher than that of today's airplane, and the liquid propellant rocket has proved itself definitely superior to the rocket in which powder forms the fuel.

we Fly by Rocket?

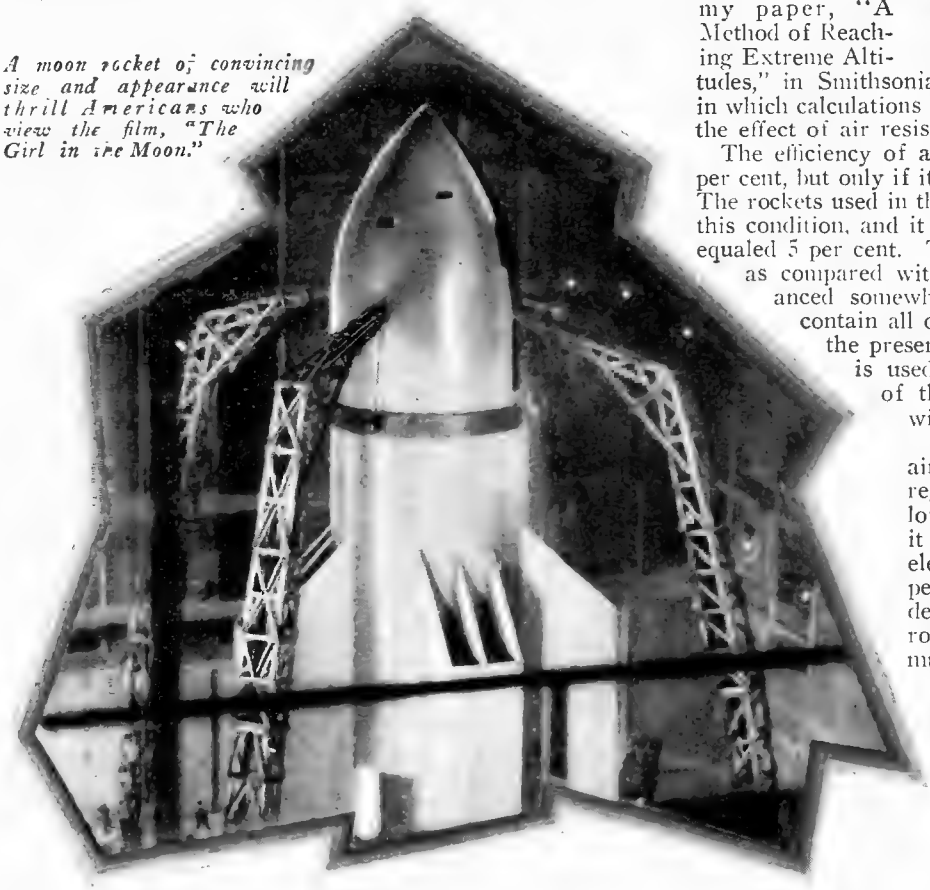


By Prof. Robert H. Goddard

PROFESSOR GODDARD'S extensive experiments with rockets at Clark University have made him known as the foremost authority on the subject in this country. You will find his discussion of liquid propellant rockets especially interesting, for he has made an intensive investigation of this type.

rocket. Very little of the mass of such a rocket is ejected as gas, and this gas has such a high speed relative to the rocket that it takes with it most of the energy of the charge. With a rocket composed largely of liquid propellant, on the other hand, the speed of the rocket itself becomes very high, so that the gases, after ejection, possess a speed that is the *difference* between the rearward speed of ejection and the forward speed of the rocket, and this resulting speed will be low after the rocket begins to travel rapidly. When this happens, much more of the energy of the charge will go with the rocket than with the ejected gases.

The possibility of covering very great distances by such a rocket as above mentioned was first shown theoretically in my paper, "A Method of Reaching Extreme Altitudes," in Smithsonian Miscellaneous Collections for 1919, in which calculations were made for various propellants, with the effect of air resistance taken into account.



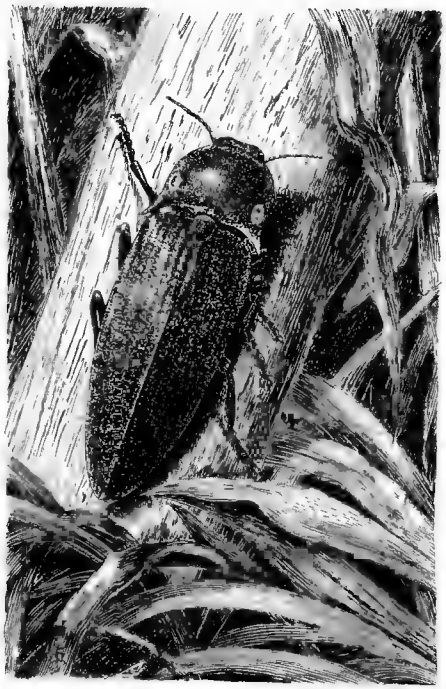
A moon rocket of convincing size and appearance will thrill Americans who view the film, "The Girl in the Moon."

The efficiency of a liquid-propelled rocket can exceed 50 per cent, but only if it consists largely of propellant material. The rockets used in the German rocket planes did not satisfy this condition, and it is very improbable that their efficiency equaled 5 per cent. This high efficiency of the rocket plane as compared with the ordinary airplane is counterbalanced somewhat by the fact that the rocket must contain all of its propellant material, whereas with the present airplane engines a large mass of air is used along with the gasoline, the weight of this air not, of course, being included with the plane.

This utilization of air by the ordinary airplane engine, while an advantage in regard to weight of propellant at rather low elevation, is the very factor making it entirely unsuitable for travel at high elevations. It cannot possibly be a competitor of the rocket above a certain air density. As to the matter of speed, the rocket, and also the rocket plane, has much greater possibilities of high speed than has the ordinary airplane. The slowing of the rocket, or rocket plane, at the end of its course can be accomplished by air resistance and need require no extra fuel.

And now we come to the question which fascinates so many all over the world—How long will it be before a rocket (*Continued on page* 1033)

"Cold Light" *in* Perfect Form Found in Firefly "Species"



The West Indan beetle, "El Cucujo," is so luminous that the natives use it for light and ornament.

THE chemistry by which certain insects produce light within their bodies has been a puzzle to scientists for ages. In this article Dr. Lemkin tells what science has discovered of the process and indicates its possible bearing on the illumination plans of tomorrow.

By

William Lemkin, Ph.D

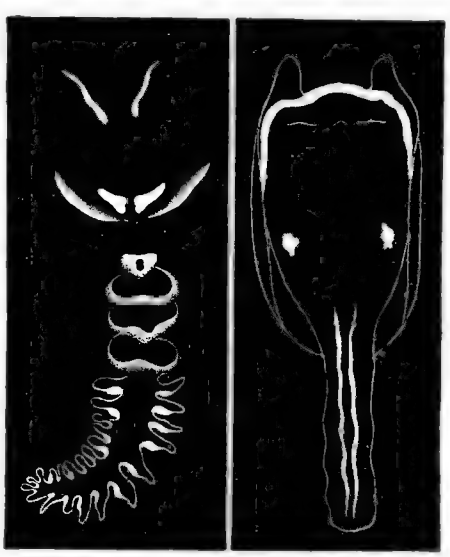
WHAT makes the firefly flash? What makes the glow-worm glow? Can the scientist in his laboratory imitate and duplicate the phenomenon of bioluminescence, as the production of light by living organisms is called? For the last few decades a considerable amount of research and investigation has been done to find a satisfactory answer to these questions. Much valuable information has been gleaned as a result, particularly in the chemistry of animal light. The study opens a vast field of possibilities, leading perhaps to the ultimate solution of that tantalizing and as yet unfathomed problem—the artificial production of "cold light."

Strictly speaking, the firefly is not a fly at all; neither is it a worm. It belongs to the beetle group of insects, and is technically designated as the *Lampyridae photinus*. The appellation "glow-worm" is due to the fact that the female of this species is wingless, and bears a striking resemblance to a worm, as does the insect in the larva stage. Not only is the adult, particularly the female, light-producing; even in the egg, larva and pupa stages this organism gives off a pale phosphorescent glow.

Examined under an enlarging glass, the lantern mechanism of the firefly appears on the last three segments of the abdomen. The microscope discloses further that this photogenic organ is made up of a ventral mass of large cells where the luminescence originates, and directly behind it is another layer of small cells which acts as the reflector. Two large tracheal trunks or air tubes pass into the light organ and branch out into every cell. These tubes give an abundant supply of oxygen to the photogenic cells. Paralleling the air tubes is a system of white, thread-like branches which are the nerves controlling luminescence.

It is obvious that the production of light by the firefly is the result of some oxidation process, regulated by the respiratory organs. The oxidizable material is some substance manufactured in the mass of white cells at the tip of the abdomen. The thick tube carries an "air blast" into these cells and the supply of oxygen intensifies the light. When, through some nervous action, the air flow slackens or suspends, the light grows fainter, or even disappears.

Scientists agree that the luminescent flashings of all insects and other organisms are intended for signaling and attracting the opposite sex during the mating periods. "There is not a doubt," says Fabre, the famous entomologist, "that the glow-worm himself manages his light-apparatus, extinguishing and rekindling it at will."

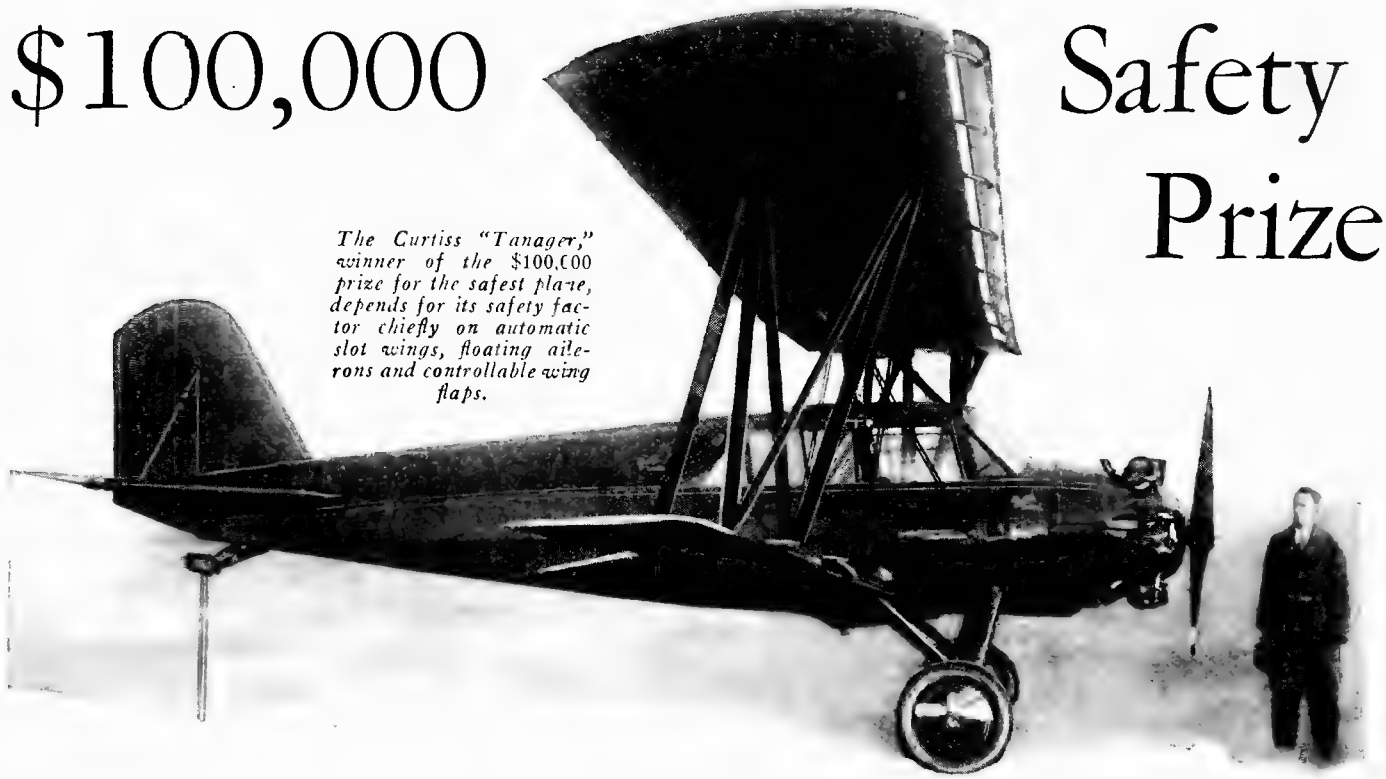


Complete lighting systems distinguish these common luminous insects.

The chemical composition of the photogenic material has fascinated and mystified scientists for many years. The readiest suggestion is phosphorus, but no amount of research has revealed the presence of this element in appreciable quantity. Indeed, anything more than the minutest trace of phosphorus would be highly objectionable to living cells because of its extremely poisonous qualities. In spite of the name "phosphorescence" which is frequently applied to the light emitted by the firefly and other luminous animals and plants, we must look elsewhere for an explanation of this strange natural phenomenon.

As far back as 1667 the necessity of air in the production of bioluminescence was proved by no less renowned an investigator than Robert Boyle. He placed a bit of phosphorescent wood under the receiver of an air pump and exhausted the air. The light disappeared but returned when he readmitted the air. Another vital chemical fact was discovered by the famous Italian scientist Spallanzini in 1794. He proved that water was almost as important as air in the production of animal luminescence. By drying any light-giving organism he caused the light to disappear. This dried material, kept for a long period, he subsequently moistened, and showed that it again became luminous. Here (*Continued on page* 1058)

CURTISS *Tanager* WINS $100,000 Safety Prize



The Curtiss "Tanager," winner of the $100,000 prize for the safest plane, depends for its safety factor chiefly on automatic slot wings, floating ailerons and controllable wing flaps.

By Joseph M. Mellen

The Curtiss "Tanager," voted the safest plane, embodies no radical changes in design. Nor is it "fool-proof." The element of human error, however, has been considerably reduced by its advent, and this should result in a real gain for commercial aviation.

"IT'S the safest airplane I ever flew," said Lieutenant Stanley M. Unstead, army test pilot. He had zoomed the Curtiss "Tanager" in an almost vertical climb straight from the ground over the top of a thirty-five foot tower and then landed it with a run of about thirty feet. This remarkable feat ended the competition conducted by the Daniel Guggenheim Fund for the Promotion of Aeronautic's in an effort to secure "progress in flying safety." The competition lasted over a period of several months, during which time manufacturers of airplanes both in this country and abroad submitted craft in an effort to win the $100,000 prize offered for a "safer plane." The Curtiss "Tanager" is particularly prized by its owners, for it not only won the prize for a safer plane but also proved that no radical changes in design were needed to procure a safe plane. The main features of this plane are the automatic slot wings, floating ailerons, and controllable wing flaps. According to Curtiss engineers, these features do not make the plane completely fool-proof but do render it the safest airplane to date.

Two Years Spent in Research

THE Curtiss Tanager is the joint project of Robert R. Osborn and Theodore P. Wright and is the outgrowth of experiments performed in the wind tunnel at the Curtiss Factory in Garden City, Long Island, N. Y. It is the conventional biplane with certain safety devices. Two years of laboratory work were spent in the endeavor to obtain a plane which would make commercial flying a safe and sane proposition. The Curtiss engineers believe this condition has been fulfilled, and offer this plane to the flying public in the hope that the factor of human error will be greatly eliminated from air travel.

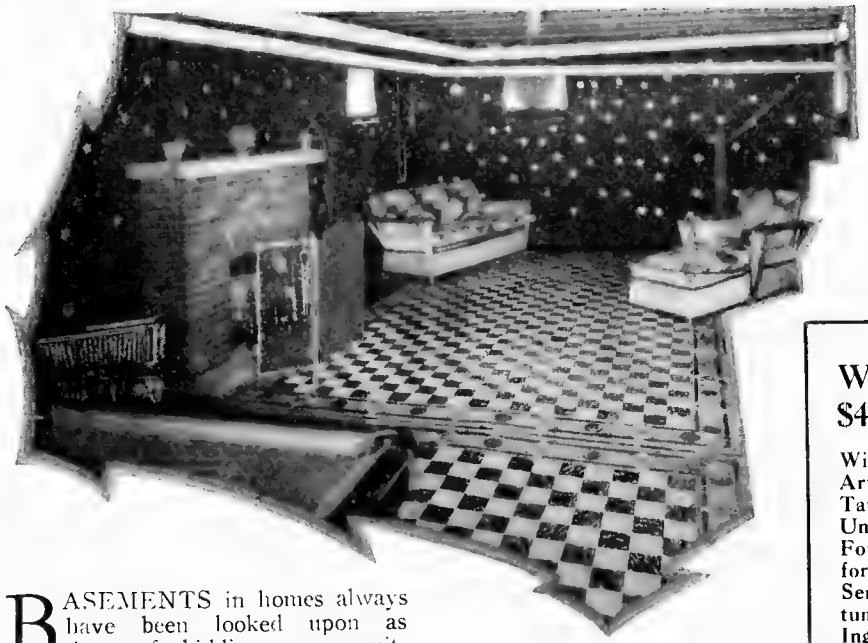
"PROBABLY the most unusual feature of the Tanager is the new Curtiss Aileron, which is floating and non-stalling," says Mr. Osborn. "This aileron is mounted on the tip of the lower wing, where it operates in air undisturbed by the wings, and where its operation does not disturb the lifting characteristics of the wings. In its simplest terms, the upper and lower surfaces of the aileron are identical, so that it has no lift unless presented to the wind at an angle."

"When the aileron control is used in the usual way, these ailerons displace with respect to themselves and not with respect to the airplane, and their action is equal and opposite. As an instance, if the control is moved so that a ten degree angle is made between the two ailerons, one will be up five degrees from the relative wind and the other one down five degrees, and this condition will maintain whether the airplane is stalled or at high speed. The maximum displacement is fifteen degrees from the wind direction."

In other words, the ailerons always operate directly into the wind, no matter what position the plane assumes in the air, using the term "wind" in an aerodynamic sense instead of an atmospheric sense to indicate the rush of air created by the plane as it moves in any direction. For example with the plane moving forward in level flight, the ailerons are level and even with the lower wing. With the wings at an angle to the wind, as in a stalled position, the ailerons still head into the wind, at an angle to the wings.

Slots and Flaps Added Safety Aids

THE entire wing surface of the Tanager is fitted with automatic front slots and controllable rear flaps. The latter have a small slot open at all times just in front of them, which prevents the flaps from stalling and burbling at the high angles necessary for maximum lift. This wing arrangement was developed after two years of research in the Curtiss Wind Tunnel. The tunnel tests (*Continued on page* 1037)



Have *a*

First of a Series of Six

WIN YOUR SHARE OF $400.00 IN CASH AWARDS

With the Appearance of This First of Six Articles on Home Improvement by S. Gordon Taylor, We Feel We Are Doing Something Unusually Worthwhile in This Important Field. For We Are Offering Awards Totaling $400.00 for the Best Plans on Basement Conversion Sent Us by Our Readers. Here Is an Opportunity for Every One of You to Put Your Ingenuity to Work. Work Your Plan Out Carefully. Make Sure It Is Practical. You Have Every Chance in the World to Win. Read Full Details of the Competition on Page 980

Stencilled silver stars on the dark wall provide an effective contrast with the checkered Congoleum rug in this basement billiard and lounge room. (Congoleum-Nairn Co.)

BASEMENTS in homes always have been looked upon as damp, forbidding areas, suitable only for the accommodation of heating plants, pipe lines, and coal bins. Fortunately this condition is rapidly changing. In many new homes today formerly wasted basement space is providing one or more rooms comparable in comfort and attractiveness with those upstairs. In addition, many owners of existing homes find that simple remodeling of the basement provides their homes with facilities not enjoyed heretofore.

Many recreational activities require space not ordinarily available in the home of moderate size. Ping-pong, shuffle board, pool and billiards are examples. All four can be readily accommodated in the basement. A space where the electric railway may be permanently set up, or where the doll's home may be a permanent attraction, will gladden the hearts of children. For the man of the house the basement provides a place for a private bar and game tables for the entertainment of friends. Here, too, he finds a "room where he may ride his hobbies to his heart's desire.

Every man with a hobby will find this trim, bright basement workshop an interesting example of what he can do in his own home. (Hammacher-Schlemmer Co.)

Whether the basement is to be used for recreation or for some strictly practical pupose, certain elements must be considered in its design and planning.

If the floor is of cement and in sound condition, its transformation may require only a coat or two of good waterproof cement paint in any desired color. Ceramic or quarry tile will provide the floor de luxe. In between these and the painted floor are a number of other attractive treatments, particularly those employing composition tile or other types of finished flooring with an asphalt base. A wood floor laid over sleepers to provide air space beneath. The wood floor may be finished to suit almost any individual taste.

Linoleum, rubber tile, and other floorings which are subject to deterioration from dampness should never be used directly over concrete not absolutely dry.

Both walls and floors will require thorough waterproofing treatment if this has not been provided for during construction. If they are subject only to surface dampness resulting from condensation or slow absorption, proper ventilation of the basement will eliminate the trouble. Dampness from these sources identifies itself by its absence in winter when the heating plant is in operation and its presence during the summer when the basement windows are closed. If dampness makes its appearance even while the heating plant is in operation, it will be necessary to apply some sort of waterproofing treatment on the interior surfaces to make the basement comfortable and livable.

Once the coal-burning heater was identified with ugliness, drudgery and dirt. Today's coal burner in no way disfigures this charming basement playroom. (American Radiator Co.)

Basement Playroom

Interesting Articles on Improving Your Home

By S. Gordon Taylor

Waterproofing compounds on the market for this purpose are too numerous for discussion here. Complete information, not only on the products themselves but also on the principles of waterproofing, may be obtained from waterproofing manufacturers or from local building supply men.

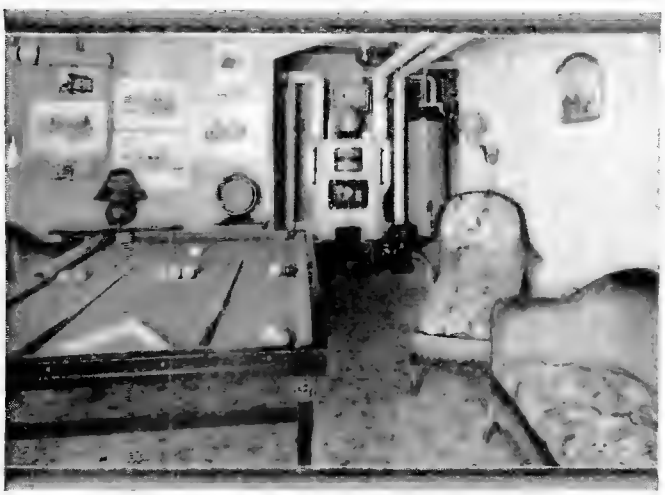
The treatment of walls, like that of floors, offers almost unlimited possibilities. In fact, it is not imperative that any special treatment be given the walls, although a coat or two of suitable paint will improve the appearance of the bare masonry. Greater attractiveness can be obtained through the use of plaster. Bond plaster or cement plaster may be applied directly to dry masonry walls or added to the waterproofing coat, if waterproofing has been required; lime or gypsum plaster on wood lath is often used, or, better still, metal lath. Walls thus plastered will take any desired finish as easily as will walls of the upstairs rooms.

If the heating plant is of the modern type, attractive in appearance and clean in operation, partitions may be quite unnecessary, except where two or more rooms are desired. The simplest practical partition is of wood, or of plaster over wood or metal lath. Partitions of common or face brick are extremely attractive, and, while they are more costly, have the advantage of being also more nearly sound proof. In general, basement partitions may be of any type which is used successfully in upper rooms.

In many basements which are utilized for living purposes no attempt is made to cover overhead timbers or piping. These may be made more attractive by paint which harmonizes with the room scheme. Plaster board provides an inexpensive material, if a finished ceiling is desired. Lath and plaster combined, of course, are extremely suitable for this purpose, because of their greater fire-resisting qualities.

In this joyful basement layout the post-Volstead chemist and the radio fan find themselves equally at home. (American Radiator Co.)

A single wood partition was the only structural feature needed to convert this basement into a tasteful clubroom. (Home Owners' Institute.)

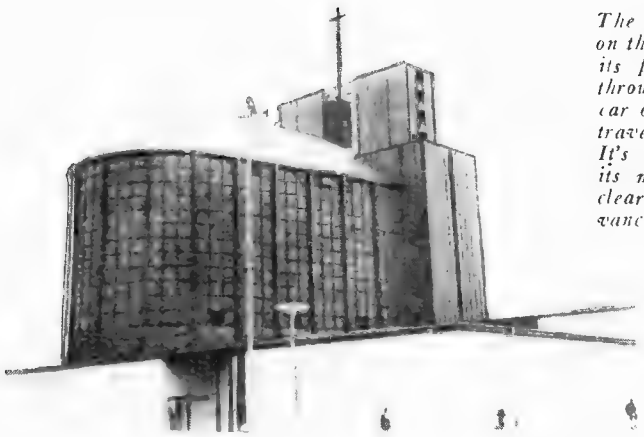


A modern oil burner warms this basement recreation room; cement plaster beautifies the masonry wall; the partition is of wood, the ceiling of plaster board. (Home Owners' Institute.)

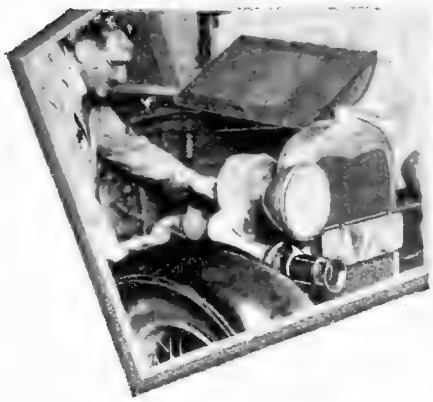
It is essential to comfort that the basement be adequately heated during the winter months. If the utilized space is separated from the heating plant by a partition, it may be necessary to install a radiator or other heating unit. Where a steam vapor or hot water heating plant is used in the house, it is usually possible to install a radiator. Such a radiator must be mounted either on the ceiling or fairly well up on the wall to insure proper drainage to the return line. Where the return line is too close to the ceiling to allow room above it for a radiator, a portable gas, oil, or electric heater will solve the problem. Or a so-called unit heater, consisting of a fin-type metal radiator and fan combined, may be installed in a closet or recess on the ground floor, and the basement heated from this source through a grille in the ceiling.

Closely allied with heating is ventilation. Unless partitions interfere, the small windows found in the ordinary basement are adequate for this purpose. Or if partitions must be installed, it is usually possible to arrange them so that the enclosed section will have windows on two sides to provide the air circulation *(Continued on page* 1040)

In the Spotlight



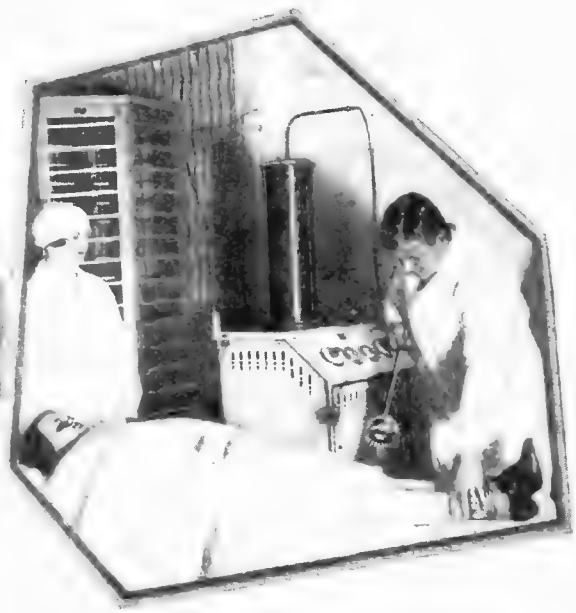
The instrument being fondled on the right is a "Foggon," and its purpose is to bore tunnels through fogs, so that the motor car on which it is mounted can travel on a clear right-of-way. It's an English invention and its makers say it will bore a clear hole several feet in advance of a car through even an English fog.



Steel, glass, and clean-cut simplicity of form make this German church a truly modern structure. Another modern feature—it has a mobility remarkable for a building of its size. After serving as an exhibit at the World Press Show in Cologne, it was bought by the city of Essen, taken down, shipped to its new home, and reassembled. The rebuilding process takes only three weeks.

Enjoy this view of the British "Hushbuster," claimed by the inventors to be a silent pneumatic road drill.

"Echophon" is the name given by Dr. Kurt Stille to his telephonic recorder, which preserves for possible reference the words spoken during a conversation over the wire. A report pronounces it "invaluable to business men," and perhaps it is, seeing that any conversational record can be effaced in a minute.

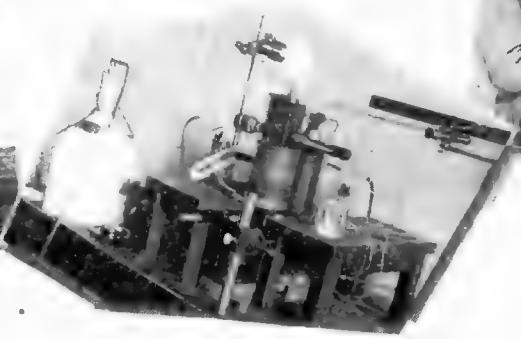


High-frequency current at 750,000 volts, Roentgen rays, and a helium lamp charged with radium are features of this machine used by Valentin Zeileis, Austrian "miracle" doctor. Heavy guns, to be sure—but heavier yet are the claims that it will cure cancer, dumbness, blindness, and lameness; and that is what its friends say it will do.

This chair, equipped with jolting and shaking apparatus, was exhibited at a chiropractors' convention.

When it rains in Berlin, you step aside to an automatic machine and treat yourself to fifteen cents worth of umbrella. And if we do say it, it's a lot for the money. The covering is of oily paper, the handle of wood.

Experiments at the University of California came to a climax when snow crystals were produced artificially for the first time in the apparatus shown below.



A box lined with reflecting metal and containing a large electric bulb makes it possible to compare forged handwriting with the handwriting of forgery suspects Naturally it is called the "comparograph."

of Science

A pneumo-cardio-sphygmomanometer functioned in the rôle of "lie detector" when Seattle officials questioned De Castro Earl Mayer regarding his alleged part in the murder of James Bassett, missing since 1928.

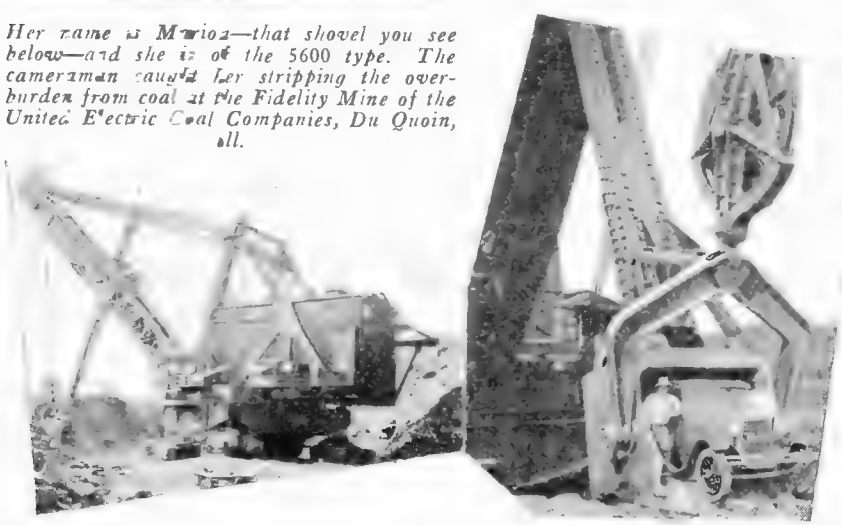
M. Santos Dumont, French aeronautic pioneer, is having fun with his inventive talent these days. His latest antic is a mechanical female figure which automatically goes through the motions of skiing. The cycle of motions involved is so perfectly carried out by this sport-style robot that she is said to serve as an inspiration for novices. In the old days, the genius of M. Dumont was directed to the development of aircraft. Long ago he circled the Eiffel Tower in a blimp of his own design.

Step by step man draws nearer to complete knowledge of the mechanism of the atom and the elements that compose it. Extremely interesting and definitely pertinent to the quest for knowledge of the electron is the achievement of Dr. P. H. Carr, graduate student at Cornell University. After much experimental work, Dr. Carr has succeeded in making photographic impressions of the electron stream on metal surfaces. Especially worthy of note is the fact that the developing process can proceed while the reproductions are made.

Street maps revolving on drums play an important part in tests for prospective motor car operators in Vienna. Manipulating a steering wheel, the candidate must steer his way through the streets, as represented on the map, while a pencil controlled by the wheel records his success or failure.

The progress of Behavioristic theory has brought with it a multiplicity of experiments in psychology with non-human subjects. At Columbia, Professor C. J. Warden has been working intensively on the intelligence of cats. Grids electrically charged were used to repel the animals from certain paths, while a bowl of milk lured them on to find the right one.

Her name is Marion—that shovel you see below—and she is of the 5600 type. The cameraman caught her stripping the overburden from coal at the Fidelity Mine of the United Electric Coal Companies, Du Quoin, Ill.



When Marion, type 5600, moves—she moves, and that's all there is to it. The reason can be seen readily in the view of her caterpillar feet above. Ponderous as she is, she works on electricity—and thrives on it.

Fifteen cubic yards—that's the capacity of Marion's dipper per bite. To her a Model A Ford is simply a passable dipperful. Let's hope that this Ford moves before she does.

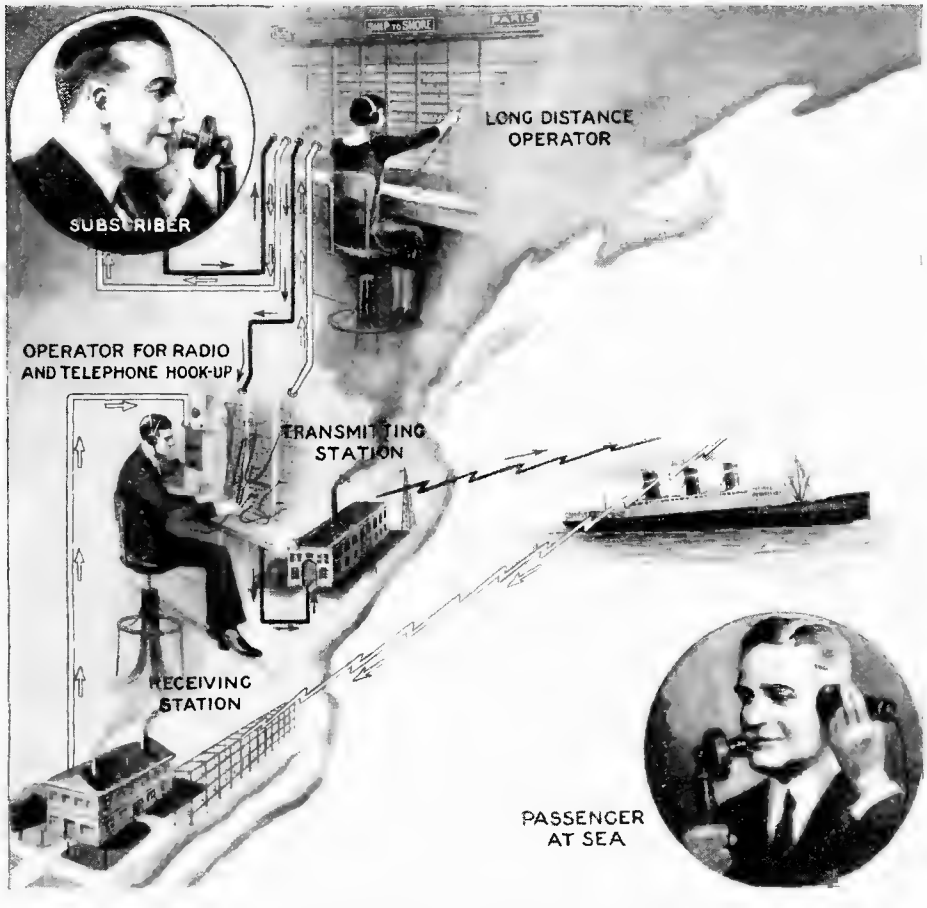
Ship *and* Shore Linked *by* Phone *and* Radio

Phone lines and carrier waves now extend the long line of communication to vessels at sea.

By George R. Brown

IT was a day in late winter. The scene was the imposing offices of the American Telephone and Telegraph Co. in New York City. A group of prosperous business men sat around a long mahogany table. In front of each was a telephone. They chatted and exchanged greetings. We tried to make ourself comfortable against the corner of a bookcase, but finding this impossible, we decided to accept our lot with resignation and be uncomfortable.

Suddenly the room grew quiet. A man of good appearance and business-like demeanor had entered and sat down at the head of the table. He began to make some remarks, so we decided to go to sleep. Suddenly we were galvanized into action—no, not galvanized; we were *rocketed* into action, for we saw him lift the receiver of the phone and heard him say, "Get me Commodore Hartley on board the *Leviathan*, please."



In America a telephone subscriber picks up his phone and asks for the Leviathan. He is connected with the long-distance operator, who, in turn, connects him with the technical operator. The technical operator arranges the radio hook-up to the ship, through the transmitting station. The reverse procedure takes place in calling from the ship.

A minute later he continued, "Commodore Cunningham, I am glad to open this service with you, the Senior Ranking Officer of the American Merchant Marine, and to the *Leviathan*, the largest American ship afloat. Transportation and communication have been linked together since the beginning of history and we are glad to continue that old relation by extending the long lines of the Bell System aboard ship so that anyone on the *Leviathan* can talk to anyone ashore."

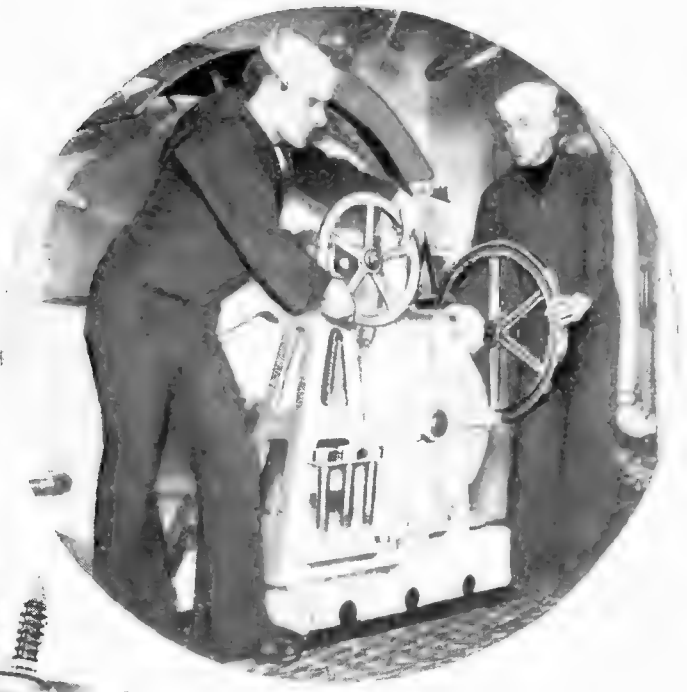
And a moment later we heard a voice which, from its accent, might have come from the sidewalks of New York instead of from the decks of the Queen of the Seas.

"Mr. Gifford, the *Leviathan* is indeed fortunate in being the first vessel to have the commercial wireless telephone for commercial use. Up to now, our passengers have enjoyed every comfort, convenience and luxury that the finest hotels in the world can provide, and now they can demand nothing more than when they can pick up a telephone receiver aboard this great American flagship and talk to their relatives back home. Permit me to congratulate you and your staff for this very splendid achievement."

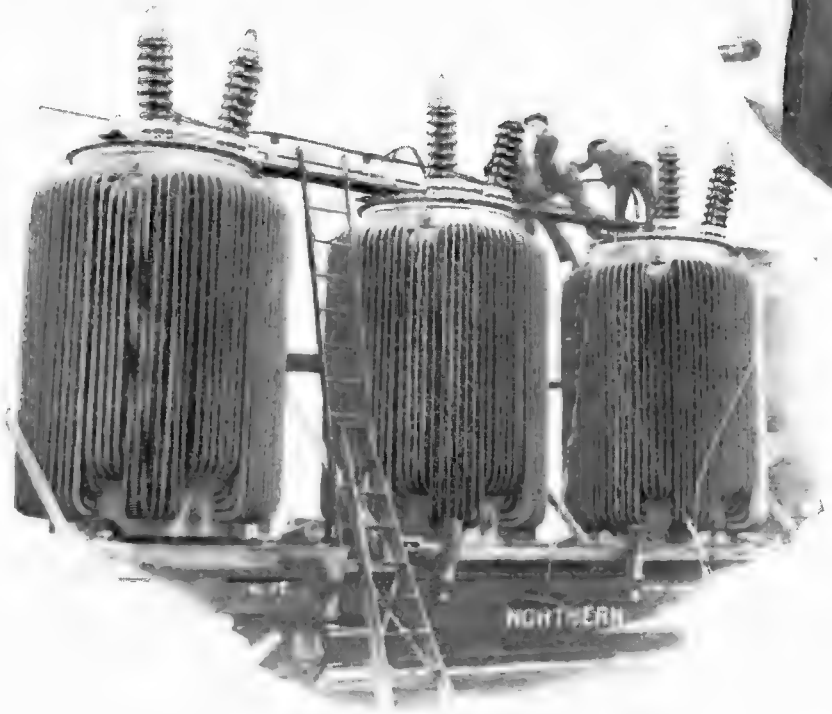
Thus a commercial venture was inaugurated which began as an experiment by the Naval Department back as far as 1916. This experimental work was carried on as part of the communications preparedness work, and was later continued after the war from 1919 to 1922. The trials did not establish the commercial venture because the conditions of commercial shipping did not warrant inaugurating this telephone service. The great increase in steamship travel and the use by the public of long distance telephone facilities, suggested the feasibility of a ship-to-shore telephone service. In addition, the contributions of radio engineers had placed this idea on such a practicable basis that it was a comparatively simple undertaking to proceed with this plan.

To complete this venture a transmitting station, located at Deal Beach, N. J., operating on a wave-length of 34.8 meters, and a receiving station located at Forked Rivers, N. J., were erected. Their radio circuits were connected to the telephone circuits leading to the long distance headquarters in New York City. (*Continued on page* 1037)

SEAGOING POWER HOUSE Saves TACOMA



Gobs turned the wheels. Jets of steam rushed through the blades of a giant turbine aboard the aircraft carrier Lexington. The electric current supply of the city of Tacoma went up to normal again. So large are the power resources of the Lexington that a single unit of its generating equipment served to supplement the lessened power of Tacoma's municipal plants.



Three massive transformers stepped up the voltage of the Lexington's generators from 4,400 to 50,000 volts, the pressure required by the city's power equipment. Tacoma's estimated monthly power bill to Uncle Sam's navy will reach $66,000, and there will be a standing charge of $45,000 per month for the ship.

Crowds gathered at Baker Dock, Tacoma, Wash., for the moment when for the first time in history a ship began to serve a city with electrical power. Despite the extraordinary nature of Tacoma's supplementary power source, the charge per kilowatt hour was kept by the navy at the municipal level.

Radio Speaks

We Announce a New and Compact Set that Clock, or Desk. No Expensive

The radio set now finds its way into many convenient corners of the modern home. With a simple remote control drive this new receiver may be placed in an end table or buffet.

By Volney D. Hurd

IS your home cramped for space? Have you an unsightly radio cabinet in your living-room? Have you ever seen a radio receiver—the tonal quality of which you liked but the price of which you did not like because of an expensive cabinet? Have you a bookcase which has some extra space, a desk which is not entirely used, a grandfather's clock with a hollow base, a buffet with an empty drawer? If you have—and you certainly must have one of these articles of furniture around your home—you will delight in this new radio set, product of the National Company. It is small, compact and modestly priced. It measures exactly ten inches by twelve inches in size. It has good tonal quality, good sensitivity and selectivity. It is completely electrified and may be slipped into a bookcase, desk, grandfather's clock or buffet. No expensive cabinet to buy; no clashing with your present scheme of furniture style or arrangement; no mysterious collection of wires or batteries—merely a compact unit to be slipped into a piece of furniture.

You would not like to have to buy a certain piano when you bought a house. You would want to put in the instrument you preferred. Neither would you want to have to buy a certain house to get possession of the piano it contained. Yet that is really what the purchaser is doing in radio today.

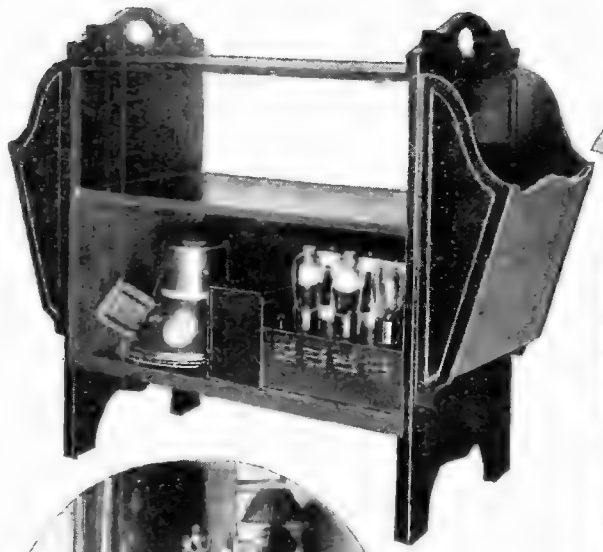
Take, for instance, some well-advertised receiver. You read about it and become convinced that you would like to hear it. You go, and after listening to it perform, you realize that it has just the tone quality that you like. Then you try and visualize it in your home and start asking to see the different cabinets.

You find that the line is limited to two or three and, worst of all, that there is a considerable price difference in these various models. You see a lowboy for, say $135. Then you ask for another model. A highboy is shown which sells for $165. You find that the speaker and chassis are identical. Then you see you are paying $30 extra for a little more woodwork. That $30 is probably the difference between your having a set and not having one. It is the price of a set of tubes for the new job. If you are still fond enough of the tone, you compromise and take the cheaper model, but always wish it had a cabinet that fitted in more with your interior decorations.

If you could get a small, compact chassis designed to give you good sensitivity and selectivity and particularly the best in tone quality at a good low figure, you could buy a good dynamic speaker chassis and then put these two in a cabinet of your choosing and have the very best in radio reception at

from Clocks *and* Books

May Be Concealed in Your Bookcase, Cabinet to Buy!



A panel fashioned as book-fronts will make this set an integral part of your book-case. In the bottom of the end-table or a drawer in the desk it may also be effectively concealed.

The capacious depths of the base of a grandfather's clock provide another hiding place for this unique radio.

a price within the range of the average radio purchaser.

If you had a small apartment, you could get a miniature console that would take this compact chassis and a dynamic speaker. This would be in keeping with the room in which it was placed and still you'd be getting superb reproduction.

Perhaps you have a living-room that demands a certain type of cabinet to fit in harmoniously with its appointments. You go into the market and pick out a cabinet to your liking, slip the chassis into place, put the speaker in and screw it into place, and there is the set for your home, all you wanted not only in tone but also appearance. And now you can obtain such a chassis. It is the National NJ 30. It is compact; it is small; it is inexpensive.

Naturally the first question which arises is, "How can you get quality in such a small set?" The answer is, "Intelligent design."

The shield grid tubes permit of considerable amplification per stage. Two stages are equal to three or four of the old type of circuit. Thus we find the set has two stages of shielded grid radio frequency. The antenna system is tuned so as to get maximum amplification and selectivity. This gives us three tuned circuits.

Sufficient amplification is obtained with this arrangement to permit of power detection. Coming to the audio end, we find for the first time in a commercial offering, as far as we know, the screen-grid tube as an audio amplifier. Here is where the quality obtained so far is insured against the invasion of distortion.

Whatever may be said about the various forms of audio amplification, it is generally accepted that resistance coupled audio is the finest possible to obtain, so much so that it is used exclusively in television sets which must have perfect audio characterstics. Using the shield grid tube as an audio amplifier, this form of audio amplification may be utilized to the full. This new tube will give as much amplification per stage in this arrangement as the ordinary tube with a step-up ratio audio transformer and still retain the tonal purity of resistance coupling.

Thus we have a single stage of resistance coupled audio using a shield grid tube following the detector. This in turn feeds into a 245 power tube for the last stage of audio. This tube will give as much undistorted output as a 210 or a pair of 171's in push-pull, which is more than the average house can stand.

It may now be seen that the finest tone quality is obtained and yet no bulky transformers are needed. The chassis consists of a small panel on which are located the off and on switch, a tuning knob, and a volume control knob. Behind this is a raised metal platform on which are mounted three variable condensers in a row, running back from the panel. On the left of this condenser gang are the two r.f. and detector tubes. On the right are the first audio, power, and rectifying tubes. This gives six tubes in all, making the first cost of tubes relatively low.

Under this platform are three shielded r.f. transformers and the various other coupling units. On the rear of this platform is attached the power supply, which is very efficient although small, and gives a good humless supply of current.

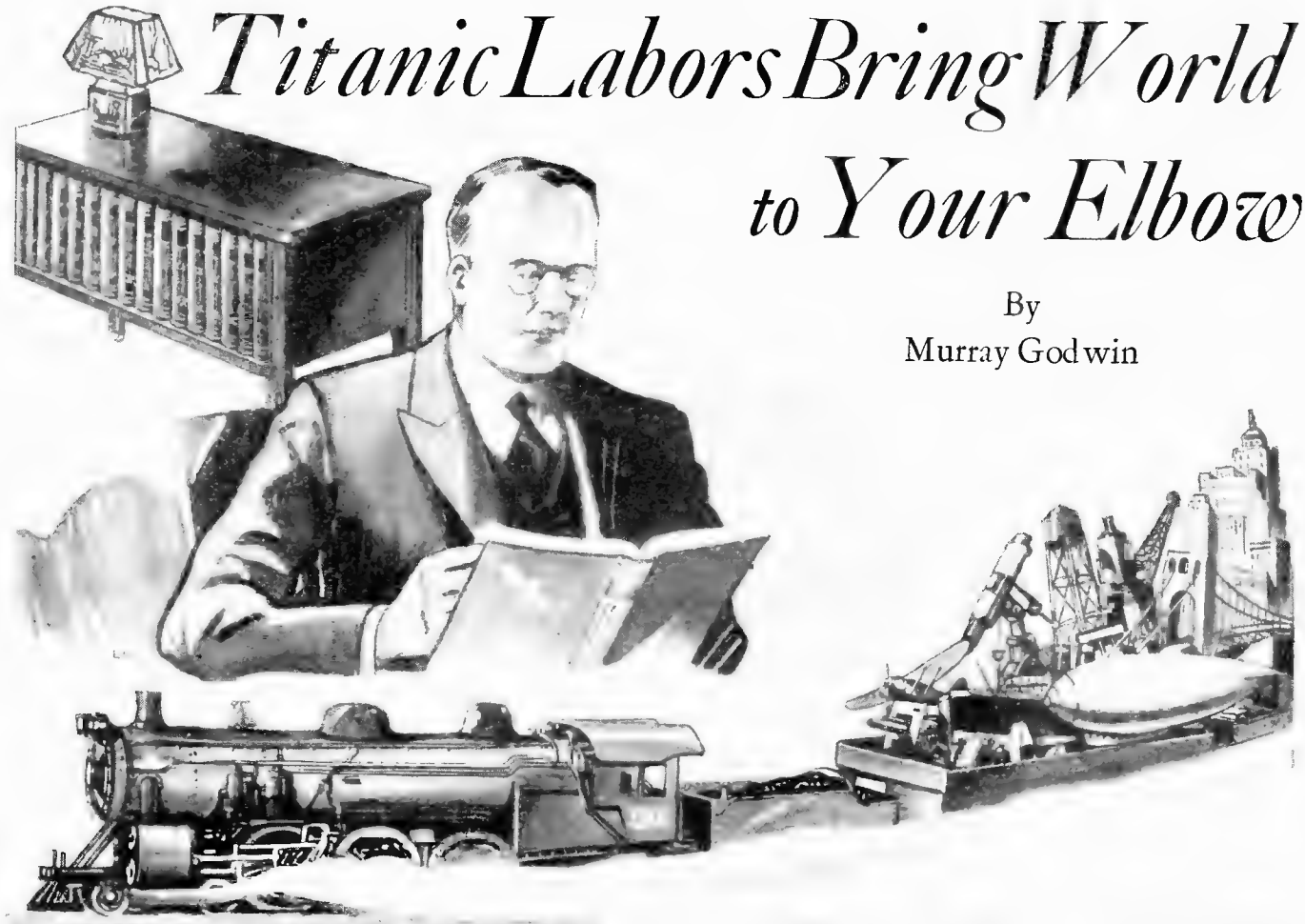
With this chassis we need only a good speaker and we have a radio receiver with the best in tone quality. Now we get back to our question of cabinet design. This little chassis will fit in the smallest of cabinets and look equally as impressive in a big cabinet.

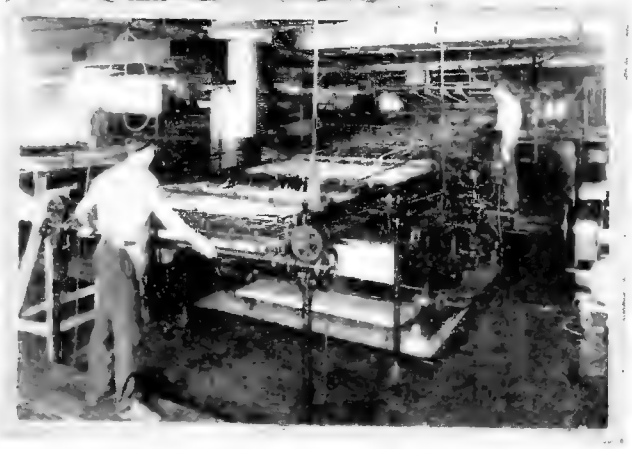
Coming to disguised radio sets, we find we have a unit which lends itself admirably to concealment. It can be fitted up so that the front panel appears like the ends of a few books tucked into your bookcase, and your radio is not taking up valuable room space.

An end table which comes up (*Continued on page* 1034)

Titanic Labors Bring World to Your Elbow

By
Murray Godwin





On finely registering presses of the most modern type, the millions of pages composing the first printing of the fourteenth edition were impressed with their universal story.

TO produce 62,500 sets of the new Encyclopedia Britannica —the fourteenth edition—were required 225 carloads of paper—enough to form a freight train 2 1/10 miles long—and 9,000 gallons of ink. Twenty thousand goatskins were used to bind the sets. Type metal equal in weight to a locomotive and tender was employed in the printing process. Placed end to end, the pages would encircle the earth and reach the moon. But far greater in importance to us were the editing labors involved in this greatest concentration of knowledge the world has known. For practical reference or for the satisfaction of knowing, here is a marvelously rich, modern and orderly compendium of what the world's most intelligent minds know about life, nature, things, and man.

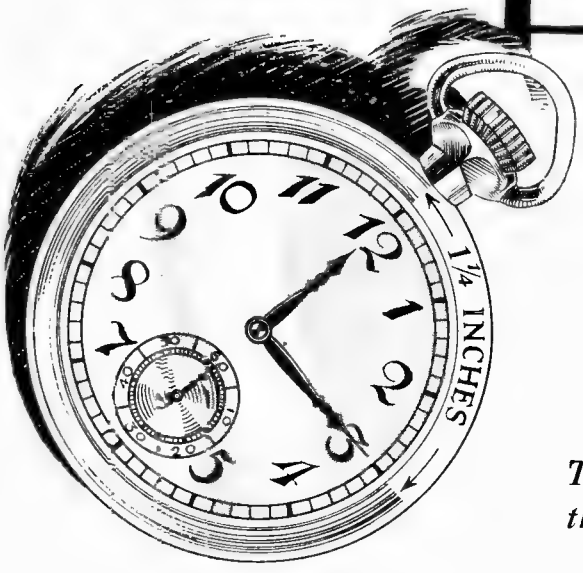
THE world as the world's best minds know it, concentrated, classified, eased, and placed at your elbow for ready reference. . . . That is the goal at which the editors of the Encyclopedia Britannica have aimed in the fourteenth edition of this universally known work. And it must be said that never before has a goal comparable been so effectively achieved.

Would you like to learn the ins and outs of quantity production? In the new Britannica, Henry Ford tells you about them in detail and at length. Does space-time puzzle you? The Britannica offers you a pointed survey of this modern dimension by Einstein himself, and supplements it with a consideration of the philosophical phases of the relativist theory, by Bertrand Russell. Do you know your electron? In the fourteenth edition, Millikan reveals to you its nature and habits.

And these examples are typical of the treatment accorded the thousand-sided contents of this fascinating work. Voronoff tells you what he knows of rejuvenation. The atom is displayed to you by Niels Bohr. Andrew Mellon expertly exposes the inwards of government finance. James J. Davis discusses labor law. Sport is covered by Gene Tunney, Grantland Rice, and other high-calibered observers. Milton C. Work describes the mechanics of bridge. The technique of mask design is explained by W. T. Benda, famous in this field.

In all, 3,500 men and women of intelligence, talent, and repute have contributed their knowledge of as many subjects and phases of subjects to the greatest editorial achievement. Nor in any instance have they merely skimmed the surface of their knowledge. The new Britannica's survey is essentially complete. Within its covers you will find more than 700 articles on the architectural field alone! Investment, science, aviation, child care, painting, manufacture, travel, home craftsmanship, and a multitude of other subjects are exhaustively explained. And you will find each explanation given point by illustrations which are a delight to the mind and eye, carefully selected, finely reproduced. There are 15,000 pictures in all and 1,500 of these are full-page plates, many of them in full color. Particularly worthy of note are the color plates. They have been produced with a richness and accuracy that make the new encyclopedia not only a book of knowledge but a work of art.

The cost of producing the new Britannica was more than $2,000,000, and the task was completed in two years.



On the face of a watch, 15 *minutes represents a distance of* 1¼ *inches.*

How Many Minutes Make a Mile?

The Relativist and His Friends Join Issue Again Over the Mingled Identities of Time, Space and Motion

By Donald H. Menzel
Lick Observatory, Mt. Hamilton, Calif.

RELATIVIST—In our discussions about the universe, we agreed that it is meaningless to speak of the curvature of empty space. For the expression to have any significance, we must introduce some sort of test-rod to detect the curvature—and then space ceases to be *empty*. Curved space is an abstract conception; curved measuring rods are tangible and concrete.

In our last discussion we temporarily laid aside a very important fact. The universe is four—not three—dimensional. This brings us to the question of *time*, and its part in relativistic geometry.

Layman—Just a minute. I don't see how time can have a part in *any* sort of geometry.

R.—There is not a tremendous difference between geometries of two and three dimensions. The line that bounds one side of a triangle may go to form an edge of a cube. On the other hand, if we are going to consider time as a fourth dimension, there arise, as you say, some fundamental difficulties. How can we build triangles out of time?

Let us try. A man walks one mile north and two miles east. We can draw a diagram of this say on the scale of one inch to the mile.

Now take this problem: A man walks a mile in fifteen minutes. The mile-part again can be diagrammed. But how are we to put the fifteen *minutes* into the picture?

Physicist—That is easy. Draw it on the scale of one inch to fifteen minutes.

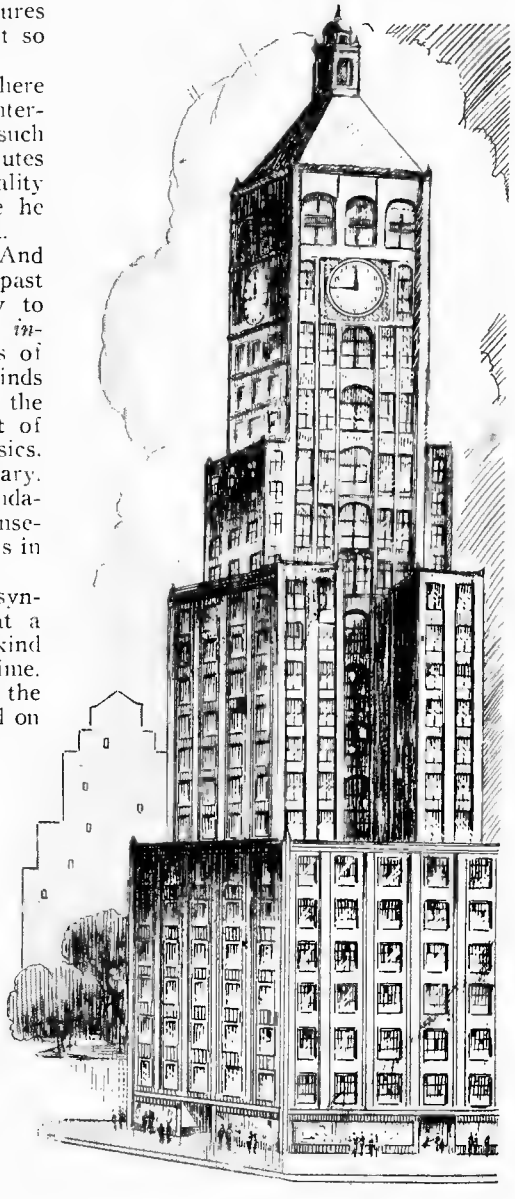
Relativist—The problem isn't as simple as that. We could draw the first picture without trouble, both because miles and inches are measures or *space*. But you will not find it so easy to divide *time* into inches.

L.—I know a common instance where time and space are regarded as interchangeable. You frequently hear such an expression as "I live thirty minutes from Times Square," when in reality the speaker refers to the distance he must travel to reach a certain point.

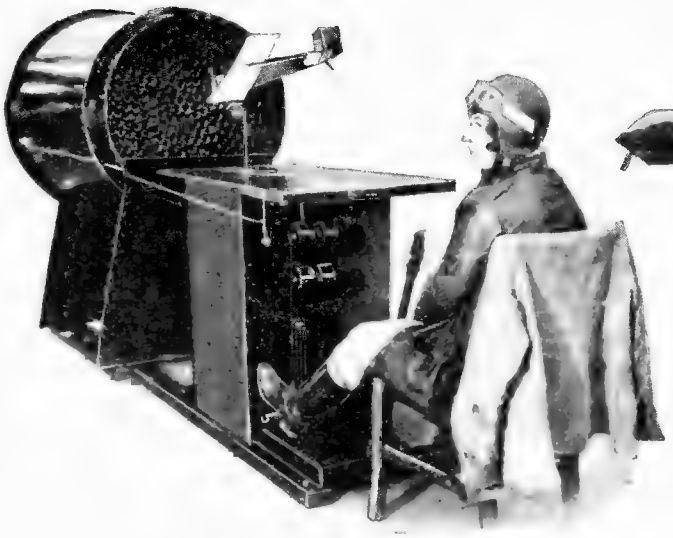
R.—You are on the right track. And here is the crux of the matter. In past discussions we found it necessary to distinguish between *time itself* and *intervals of time*. We are conscious of a sequence of events which our minds recognize as being accompanied by the passage of time. This vague sort of time is of little importance to Physics, where clear definitions are necessary. You know, yourself, that the fundamental nature of time is of no consequence to you. Your chief interest is in clocks, in measures of time.

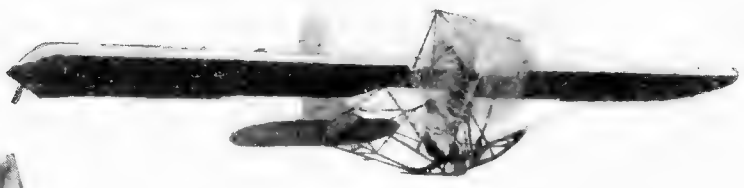
Time and motion are practically synonymous. I have said before that a world without movement of any kind would also be a world without time. There are many ways of measuring the passage of time, but all are founded on the same idea—motion of something or other—water flowing through an orifice, falling sand, the earth's rotation, revolving clock-hands, and so forth.

This gives us a chance to complete our picture; we see that intervals of time may be represented as intervals of space. On the face of my watch, for example, fifteen minutes are approximately an (*Continued on page* 1048)



A tower clock read at the distance of a mile gives you the time 1/186,000 *second later than it actually is.*





A POWER glider that will take off in one-fifth the time and distance required by an airplane and that will glide to a safe landing at 15 miles per hour was recently demonstrated at Seal Beach, California. It is powered with a 40-horsepower motor.

What's New

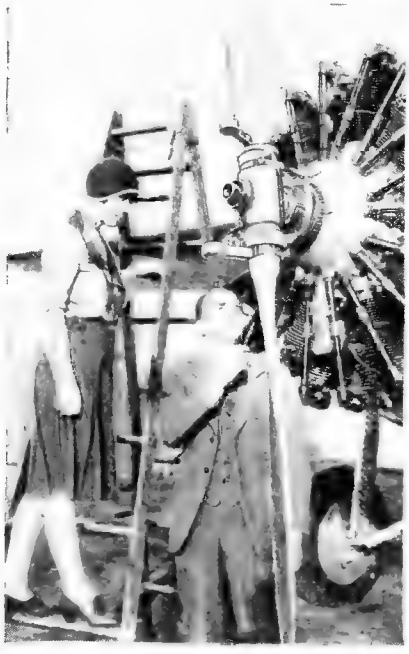
Learn to Fly With Midget Plane

STUDENT pilots find that controlling a miniature ship by means of the usual stick gives them all of the necessary movements that they will eventually have to execute when they pull their first big ship off the ground. The control is mounted on a base and by means of appropriate cables communicates with a miniature airplane model held directly in the path of wind produced by a small wind tunnel. All sorts of maneuvers can be executed.

Boat Carried Like Parachute

A COLLAPSIBLE rubber life boat that is strapped to the flier's back in the same manner as a parachute was recently demonstrated at the National Safety Council's Annual Conference at Chicago. Should the plane be forced down in water, the boat is unfolded and inflated. It will hold four men.

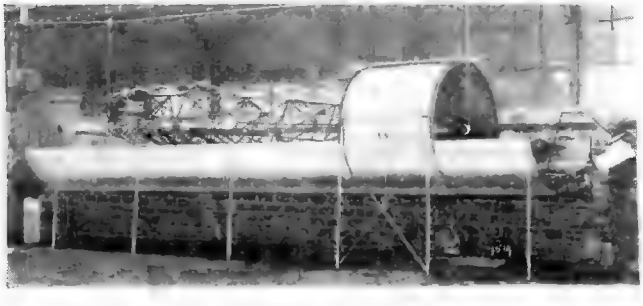
Reversible Propeller Becomes Brake



A REVERSIBLE propeller has recently been designed which for the first time gives a brake and a reverse to airplanes. A chain drive changes the pitch of the propeller. When passengers enter the plane the pitch is so decreased or even reversed that no dust or wind is produced. When ready to take off, the pitch can be increased to maximum giving a much faster take-off, a faster climb, and faster cruising speed. By reversing the pitch of the propeller when landing, the landing area can be greatly decreased. Mr. A. K. McLeod is demonstrating the propeller to Miss Vera Dawn Walker at Los Angeles, California.

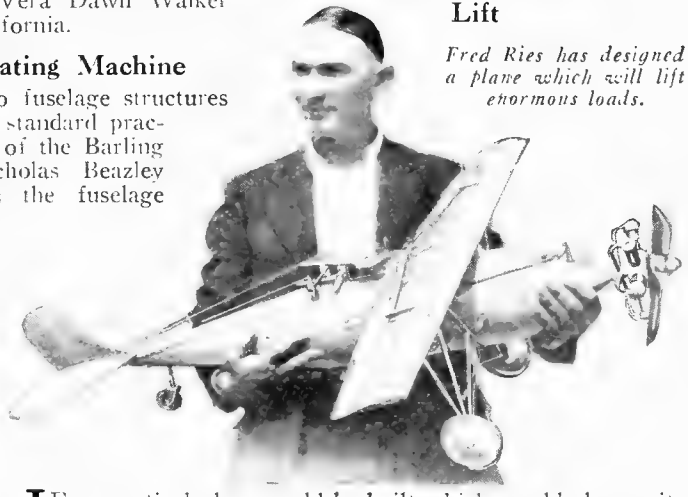
Fuselage Treating Machine

APPLYING oil to fuselage structures of planes is a standard practice in the building of the Barling planes in the Nicholas Beazley plant. This treats the fuselage against corrosion. Oil is supplied from perforated tubes inside the cylindrical-shaped booth.



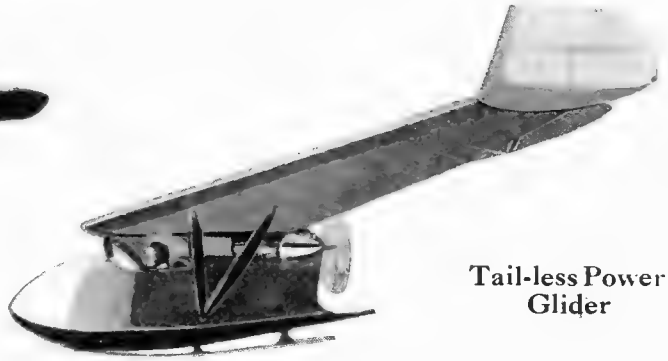
Sliding Wing on Plane Changes Lift

Fred Ries has designed a plane which will lift enormous loads.



IF a practical plane could be built which would change its wing surface, increasing it for both the take-off and the landing, and decreasing it when in the air, the speed of the plane could be greatly enhanced. With these facts at his command, Fred Ries, of Compton, California, has been granted a patent on a sliding wing device for airplanes which will do just this.

PROPELLERS under each wing of a large metal monoplane helped to get this ship into the air with a run of but 75 feet. The inventors, Messrs. Allison and Johnston, of West Palm Beach, Florida, gave the demonstration at Milwaukee, Wis.



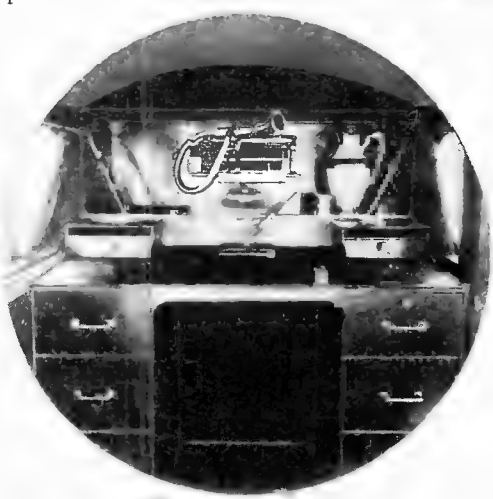
Tail-less Power Glider

ALL Germany watches with deep interest the flights now being made by the power-driven tail-less glider. This glider has an 8 horsepower motor which is very compact, and is placed behind the pilot's seat. The rear fuselage has been almost completely eliminated and the wings present a V shaped form when viewed from the top. The rudders are placed at the tip of each wing, and the elevators are the trailing ends of the V shaped wing structures. The glider has no wheels, but is provided with a runner. It is launched by the usual elastic band method.

in the Air

Limousine Comfort in Plane

THE sister ship to the "Spirit of St. Louis" typifies the trend toward comfort in the new Ryan Brougham. It is equipped with a 300 horsepower Wright Whirlwind and has a cruising speed of 120 miles per hour.



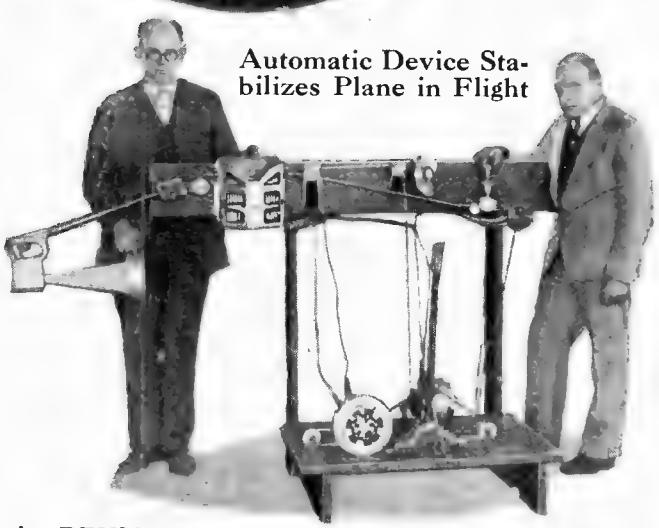
Flying Office

BECAUSE of the demand for an office-equipped airplane for business and professional men, the Ryan Aircraft Corporation has designed a model equipped with office desk, dictaphone, filing cases and other office conveniences.

Glide Planes to Fogless Fields

AS long as radio apparatus on planes is subject to mechanical difficulty and failure of operation, other means for guiding planes to air fields must be devised. Accordingly, Captain Burdette A. Palmer, of Los Angeles, California, has developed a captive balloon system which promises to create considerable interest. The device consists of a captive balloon which supports several electrically - controlled automatic instruments that inform the operator of the extent of the fog, indicate the wind direction to the aviator, show the pilot the extent of visibility below the fog, and also show the pilot the number of the nearest airport where there is a ceiling of sufficient height for landing in case there is no visibility over the airport where the balloon is anchored.

Automatic Device Stabilizes Plane in Flight



A DEVICE to keep the plane level without the aid of the pilot was perfected after years of work by Otto W. Greene of Elyria, Ohio. The control is a combination of vane and pendulum which react to a disturbance of balance of the plane either laterally or fore and aft. These make the necessary corrections.

Aladdin's Lamp in the Laundry

By
Mrs. Christine Frederick

Founder and Director of Applecroft Home Experiment Station and Authority on Household Problems

AMERICAN women are saying farewell to laundry drudgery. Not even content to stay where they were a few years ago, with electric washing machines and wringers, they have gone beyond. They use electric ironers and new soap preparations which do by chemical action what women did by rubbing years ago—all veritable Aladdin's lamps. It is perfectly amazing how the labor of the family laundry has been cut down. Not for American women is the work which European women still consider necessary. As a matter of fact, few things shock Americans traveling in Europe more than seeing women kneeling on stones at the edge of a river and rubbing clothes. That savors of the Middle Ages!

But one must be equipped for modern laundry methods—must provide an efficient plan and layout. The house with sufficient space may have a laundry 8 by 10 feet, 10 by 12 feet, or 12 by 14 feet; for the smaller house a laundryette 4 by 6 feet is practicable.

Unfortunately, in the past, the laundry area was usually located in the house basement, with its damp floor, poor light and ventilation. Extra plumbing had to be installed, and most important of all considerations, to wash and iron in the basement meant unnecessary absence from other house duties and supervision of small children, as well as constant running up and down stairs.

Therefore, especially in new houses of the "self-service" type, locate the laundry on the first floor level. Here it will be much more convenient for the housekeeper, will effect money saving by a combination plumbing installation between kitchen and laundry area, and will be a warmer, lighter, more cheerful place in which to work.

Just as we know that the modern kitchen must be located properly, so that laundry is most efficient where the equipment is placed for work to proceed in a chain of steps to a definite end—what the experts call "routed work." Should the stove be placed near the set tubs so that hot water may be poured easily from stove to tubs? Or at the opposite side of the room, where it will be necessary to walk ten feet with each pail of water?

Landers, Frany & Clark

Doubling up on work, this combination machine washes clothes speedily, then dries them in three minutes.

Arrange all equipment so that there is the shortest distance between any correlated points of work, thus: A—stove, set tubs and washing machine in one group; B—Ironing board, ironing machine and table for sorting in separate group.

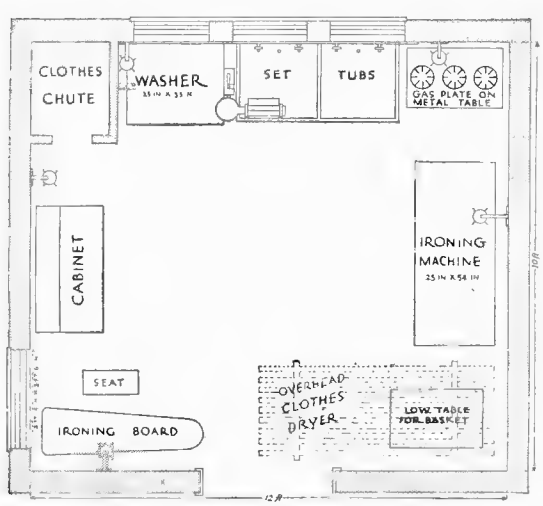
Stationary tubs of slate or enamel, connected to a waste outlet with both hot and cold water greatly reduce the labor of laundry work. Although generally a washing machine is filled by a section of rubber hose, it is possible to permanently install one, placing it against the wall to fill from hot and cold faucets. In every case a washer should be piped to a discharge, as this saves the laborious work of pailing waste water. If a boiler is used, it should be fitted with a faucet at the lower end, to facilitate pailing.

The washing machine should be considered as a third tub, and both tubs and washer should be placed at the same height—from 40 to 42 inches. Which distance from the floor to the top of the roll rim of tubs proves excellent even for short women. It enables them to work at elbow level. Making both tubs and washer of the same height permits continuous, easy movement from one to the other.

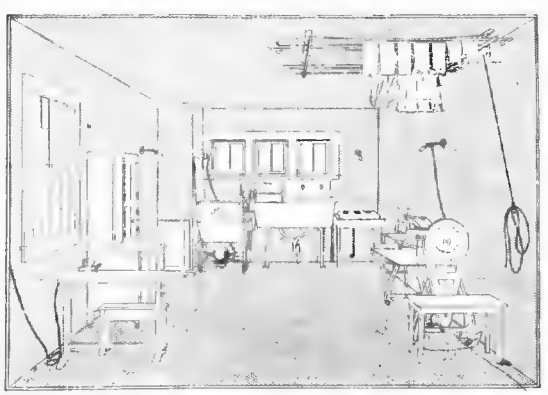
Every laundry requires some kind of table on which to remove stains, sort, and sprinkle clothes. The improved steel tables with porcelain top are excellent, especially if in cabinet form. In these the lower compartments hold irons, starch, soap and other supplies. In large laundries an entire kitchen cabinet serves well as both table and cupboard.

The ironing machine is usually fitted with its own stand, insuring perfect height and sanitary cleaning. An indoor dryer is not a necessity, but is convenient if space and purse permit, and often combines with the stove to heat the boiler.

Intelligent systematization in doing laundry work is a great saver of time and energy. Unfortunately the sheer technique of laundry work, as made possible by (*Continued on page* 1060)



You will save weary hours of labor in this scientifically planned home laundry.

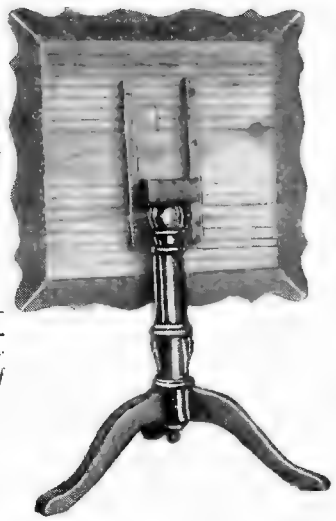


The well-arranged laundry proves as decorative as it is useful.

The three-legged table may be made with either a plain finished top or an inlaid center and molded edge, as shown at the left.

Build Your Own TILT-TOP TABLE

By H. L. Weatherby



This back view shows the simplicity of construction which renders it easy for the home worker to build this serviceable piece of furniture.

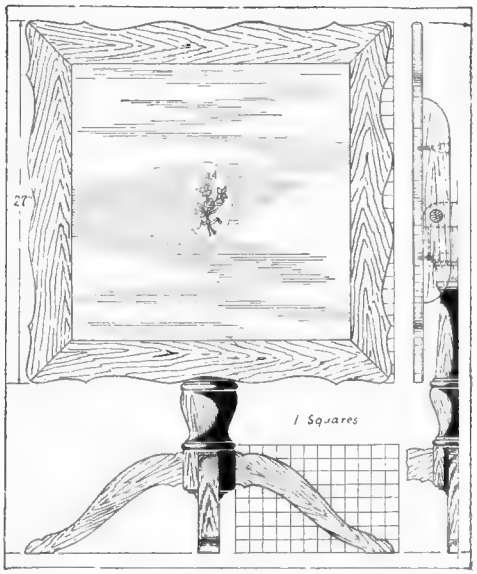
IF you men would like to gain the favor of the women of the household, sit down, read the plans on this page carefully, and make a card table, at a nominal cost, which will delight the heart of any good housewife. Three centuries ago a tilt-top table of this identical design pleased the women of Merrie England and kept the men at home playing cards. Why should it not do the same for you and yours? It is simple in design, easy to construct, beautiful to look at—and it costs very little.

Building the Top

THE writer selected American black walnut as being the most satisfactory wood for the table. Building the top calls for careful tool work and a good job of glueing, otherwise open joints may result. A cross-section of the top, shown in the detail drawings, illustrates how the top was built up. A pine base for the center portion was used. This was run over the circular saw at about one-inch intervals on both faces, to permit the kerfs or cuts to take up the expansion that will occur to a considerable degree in a wide piece of wood. These saw kerfs can be put in at the local mill, if the home shop does not have a small circular saw.

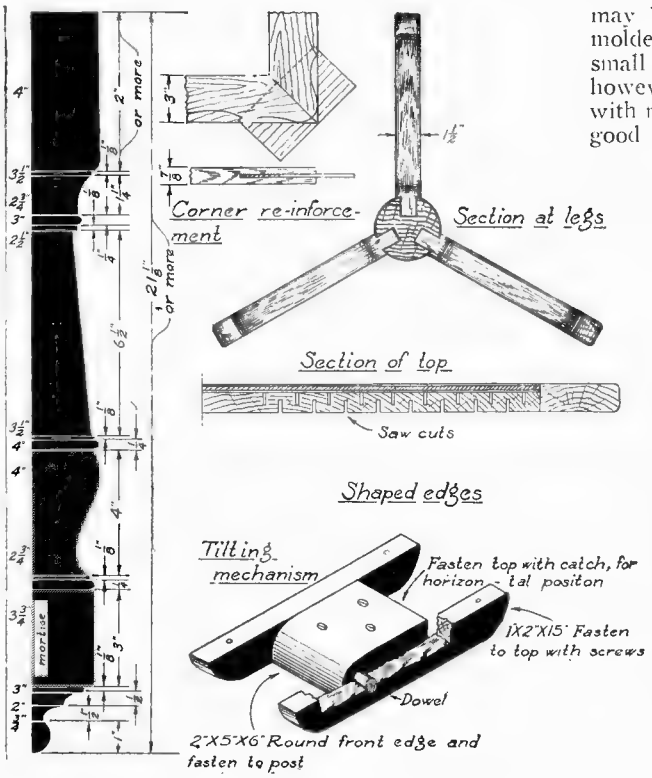
Beautiful Grain Possible

TO this pine base a piece of three-ply ¼" walnut veneered wood was glued for the top surface. This construction was used for three reasons. Beautifully figured grain can be secured in plywood panels much more easily than in solid wood, inlay designs can be easily set into the wood by cutting and peeling off the top layer, and in building the top up in this manner there is very little danger of warping and splitting that might occur in solid wood. Numerous hand clamps are necessary to glue these two parts together or the work should be put into a press. In case the center portion is built up of a single thickness of ⅞" wood, numerous saw kerfs should be cut with the grain on the bottom side to prevent warping and swelling. When the center portion has been prepared and very carefully squared to size, a three-inch mitered frame is built up and glued to the edges. The best method to follow in glueing this edge is to fasten the whole thing down to a bench top or other level surface and then to use bar clamps both ways. The miters must be very carefully fitted of course, and they should not be nailed.



The woodwork may be easily constructed if the dimensions shown above and the suggestions for cutting the legs are carefully followed.

Follow the dimensions for turning the pedestal, the method of laying out the top, and the illustration for tilting mechanism, and you will have no difficulty in building this table.



After the glue has set on the frame, splines are set in the corners by making a saw cut and glueing in a thin piece of wood, as the drawings show. After this has dried, the next step is to lay out and cut the edges of the top, using a cardboard pattern laid out by the design given.

After this has been done the top may be taken to the mill, where a molded edge may be cut at very small cost. This is entirely optional, however, and an edge left square with rounded corners may be quite as good looking.

Inlay designs may be had which, with very little trouble, can be set into the top and add greatly to the appearance of the finished table.

Turning the Pedestal

WITH the completion of the top, we may turn our attention to the construction of the center leg or pedestal. It is quite likely that this piece will have to be built up. It is a difficult matter to secure a sound piece of wood four inches square. After it has been prepared, a hexagon should be laid out on the end, in order to locate the mortises for the feet, which should be cut before the piece is turned. In this way the mortises can be so spaced that they will be equi-distant on

(*Continued on page* 1034)

The way I see it—

Science at the Draining Board

SCIENCE anciently was identified with whiskers, flowing robes, solitude, and a tendency to gabble mystically. Twentieth Century Science sociably snuggles close to home and shows a deep interest in common things. For instance, dishwashing . . . Science recently held a stopwatch at the University of Chicago, while Miss Nellie Vedder washed a carefully averaged selection of dishes, glasses, silverware, and stored them in their proper places. Three ideal methods were tested. One of them, by which a day's accumulation of tableware was washed just before luncheon, was found to save the housewife six minutes in time and 500 distinct motions in labor—an achievement of which Science can be modestly proud. Undoubtedly there was some amusement in being a scientist in the ancient days. At the same time, it's more fun to help folks than to awe them. Science has found that out.

Long-Distance Freshmen

ANOTHER thing it's hard not to like is the way Science is bringing the Higher Education, once reserved for the Elect, to the elbow of practically everyone who has the will to learn. Considerable useful and interesting knowledge has been distributed by radio in the past. Now it seems that radio is going to be employed as a medium for university courses on a national scale . . . At least that is what has been proposed to Secretary Wilbur by the Advisory Committee on Education by Radio. The committee's plan calls for a national university, set up in the Federal Office of Education, endowed to the extent of $10,000,000. With a fund of that size the finest teaching talent could be engaged, and every man and woman in the land could help himself to a university degree by turning a knob and listening in at regular intervals. Nor, regardless of where he might be, would he have to miss a lecture, as long as there was a receiving set within earshot. One of the drawbacks would be the impossibility of class reunions.

Relief Yrrhgently Needed

ONE phase of education that offers a puzzling problem to Science is the anarchy of English spelling. At present, spelling depends not on rules but on memory. After exhaustively studying the phonetic possibilities of the single word "circumference," Dr. Horn of Iowa State University has found that it may be spelled in no fewer than 396,000,000 ways, all—from the standpoint of sound—correct. You begin to understand the reasonableness of this figure when you consider the number of ways in which the second sound in "circumference"—"ir"—may be arrived at. An inventory of English words shows that er, or, ar, our, ear, ere, are, err, car, sur, re, yr, yrrh, irr, urr, and orr (nor is this list complete) are pronounced, at one time or another, like the "ir" in "circumference." From this hint it isn't hard to imagine what the possible variations in spelling may be, when the many other sounds in the word are similarly analyzed.

Large Selection Now Available

IN the course of his investigations Dr. Horn found that English contains twenty-two combinations having the phonetic value of long "e." For the letter "a" alone a child must learn forty-seven phonetic equivalents. Such hope as exists for sane spelling rests on the fact that in the United States "parasite" letters are being dropped—for instance, the "u" in "honour,"—but these gains are as nothing compared with the confusion that characterizes English spelling as a whole . . . One fundamental defect which seems to inhere in "memory" spelling is that things wrongly learned persist as strongly as those learned in the right way.

Post-Volstead Vision

PROFESSOR Paul E. Fields of Ohio State has been investigating the educational field, too, and very interestingly, below the human level . . . Or, to be strictly scientific, *outside* the human area. After administering hundreds of lessons to twenty-four white rats, Professor Fields was rewarded by seeing them learn to distinguish between simple geometrical figures, including triangles of various types. In the latter case the rats learned to recognize difference in size, position, and distance apart. Professor Fields' primary purpose, however, was not to teach geometry, but to gain an idea of the efficiency and pecularities of the rats' optic equipment. The results of the experiments indicated the image presented to the rat eye is large and slightly blurred.

Why They Speak Loudly

WHILE Professor Fields was discovering that Nature had mysteriously provided an out-of-focus optic equipment for rats, New York's Committee on Noise Abatement discovered that the modern metropolis was providing taxi and bus drivers, traffic policemen, and printers with an out-of-focus hearing equipment. Several other occupational types were included among those whose aural impressions were becoming increasingly "blurred" from the impact of the city's noise.

Quiet Radiators

THE modern world isn't as modern as we think—at least in the matter of domestic conveniences. Exploring the ruins of the palace of Founi, Isle of Cyprus, built about the fifth century, B. C., Professor Gjerstad of Sweden found a hot-water heating system of practical form. Water boiled in a room in the lower part of the palace formed steam which was distributed for heating purposes to the second-floor bedrooms. . . . From one standpoint, ancient plumbing was superior to ours. It was constructed integrally with the house itself, anticipating by some centuries the type of concrete house proposed—I think by Edison—for us today.

Off Like a Shot

THE expressed opinions and plans of Herr Hans von Opel, recently arrived in this country for a study of our aviation and automotive industries, synchronize in a gratifying degree with the conclusions reached by Professor Goddard of Clark University, our foremost experimenter with rockets. Particularly in point are Herr Von Opel's views of the rocket powered by liquid propellant . . . Rocket power thus generated, declared the distinguished German, can by its nature be controlled with the same certainty as that which drives a modern motor car. As Professor Goddard points out, the liquid propellant rocket is also more efficient with respect to the proportionate weights of fuel and complete rocket . . . First to fly in a rocket plane, Herr Von Opel sees the day when 1,000-passenger planes will be rocketed across the Atlantic at a height that will free them from all but the slightest atmospheric resistance.

Nose Up, Nose Down

THE Guggenheim competition for safe airplanes brought forth nothing as revolutionary in design as the autogiro of Cierva. Yet it appears that the winning "Tanager" demonstrated itself a safe ship in an extraordinary degree. Lieutenant Stanley M. Umstead drove the "Tanager" in an almost vertical climb over a 35-foot tower, then landed it with a roll of only about 30 feet. Here, surely, is safe aerial performance.

Type Like Lightning

~~300 WORDS A MINUTE~~

By Mary Jacobs

The typist recognizes the words printed on the pasteboard vocabulary chart (represented by letters here) attached in back of the automatic keyboard: The chart and spelling factors are changeable for writing, billing, posting—for any 16 different types of machines.

"NINETY percent of our daily vocabulary consists of 400 words—words for which the stenographer must memorize signs and symbols. 'Dear Sir,' 'Yours truly,' and more complicated phrases occur time and time again. Yet she must type each letter of each word singly. Why not a typewriter on the shorthand basis to print common words and phrases with about two operations? No more shorthand notes for the stenographer; no longer would she exhaust her energies pounding out page after page, every word requiring several depressions of keys."

So thought Clyde C. Balston, and started out to design the typewriter of his dreams. Model after model he made and cast aside; years and dollars he consumed in pursuit of his task. Today he has perfected a series of 16 machines, all using a keyboard with interchangeable vocabulary charts and spelling or calculating factors, but serving varied purposes—from office spelling and writing to billing, automatic subtracting, and posting.

All the models follow the design of the office phrase spelling and writing machine, a definite improvement upon the office typewriter. This automatic writer has a mechanical speed of 1,000 words a minute, an operative one of 300 words a minute. The longer the word or phrase to be typed, the greater the speed per word—for simultaneously with the depression of one of the outer keys and one of the "blind" keys of the keyboard, the word or phrase will appear, regardless of its length. The operation is practically noiseless; the machine can write and spell in foreign languages; the chance for human error in ordinary spelling and calculating is almost eliminated.

The machine is twice the size of the ordinary typewriter, and includes a detachable pasteboard vocabulary chart, corresponding to the keys of the outer left and right sides of the keyboard, a "blind" keyboard, and the regular typewriting keyboard (for odd or unusual words).

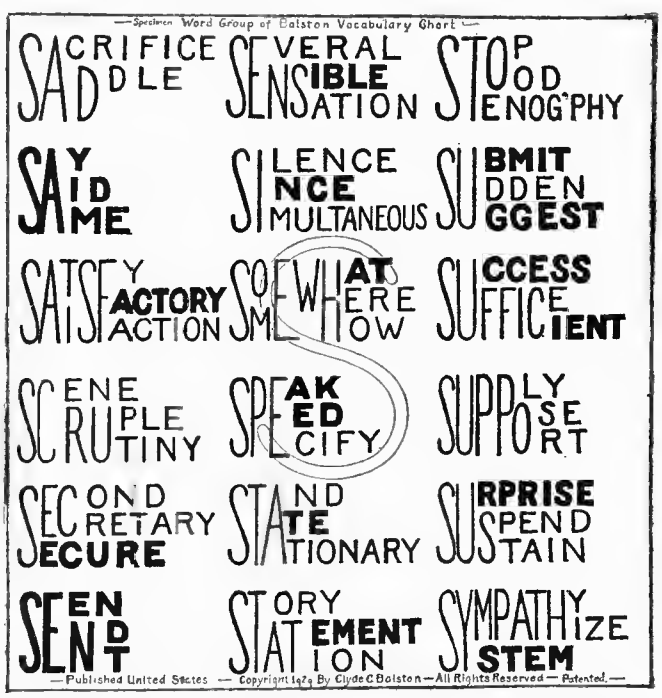
The most common words and phrases are printed in the chart squares above the automatic keyboard. This chart has 4 horizontal rows of 10 squares each; the upper 3 for words in ordinary use, the lowest one for technical phrases peculiar to any particular business or profession. It can be removed instantly to permit the substitution of any other strip with another set of technical terms.

The initial letters of the words grouped on each square is printed in enlarged form (see the S of the illustration) and the letters follow the standard keyboard arrangement. The operator locates words and phrases from the chart and types them with the corresponding keys of the keyboard. She depresses one outer key and its complementary "blind" key for an entire word or group of words.

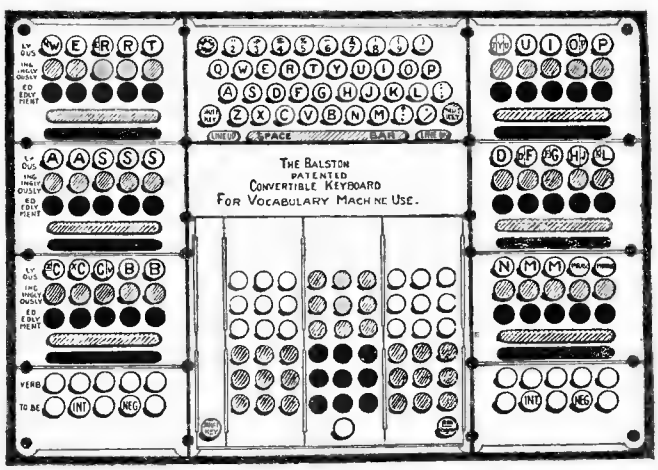
The 4 horizontal rows of keys, 5 to the left and 5 to the right of the automatic keyboard, follow the exact order of the chart squares, which they govern.

As to the "blind" keys, they contain no lettering at all; they pertain to all the words or phrases of the chart. Just as each square there contains a left, center and right column of 18 words each, so the center "blind" keys represent an equal number. We have 3 separate vertical sections, and each section has 6 vertical and 3 horizontal keys, making 18 to the section.

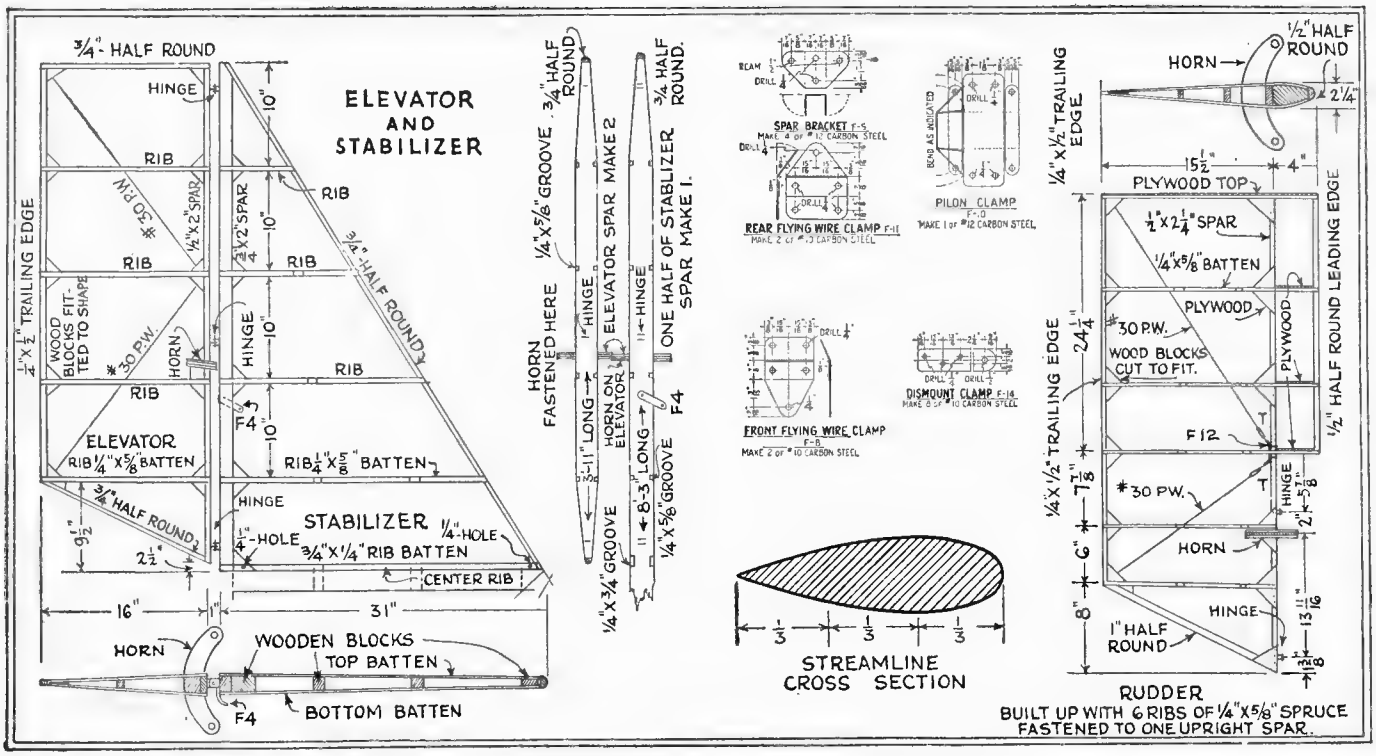
For example, we want to spell (*Continued on page* 1045)



Each square of the chart contains 6 vertical and 3 horizontal columns, alphabetically arranged. The squares follow the standard keyboard for position of letters.



The regular single type typewriter keyboard, center back, serves for infrequently used words; the "blind" bank of keys, center front, together with the lettered keys arranged to the left and right sides, print the words or phrases with but two operations.



Here's *the* Second *in Training Glider*

By Lieut. H. A. Reynolds, 368th F.A.O.R.C.

AS a sport, gliding is spreading with amazing rapidity over the United States. Many glider clubs are being formed. Most of them will build their *primary training gliders* themselves. For the benefit of those who wish to build their own gliders without incurring undue expense, the writer offers this primary training type, which follows closely the description printed in the June and July numbers of SCIENCE AND INVENTION.

Simplicity of construction has been aimed at throughout. Bolt sizes are presented in easy procurable dimensions, and drills of stock sizes consequently can be employed. Where it is found most practical to secure parts from an airplane supply concern, the names and addresses of firms patronized by the writer are given. Prices and specifications of parts purchased are also included, so that the amateur builder will have some standard to guide him in securing his own supplies.

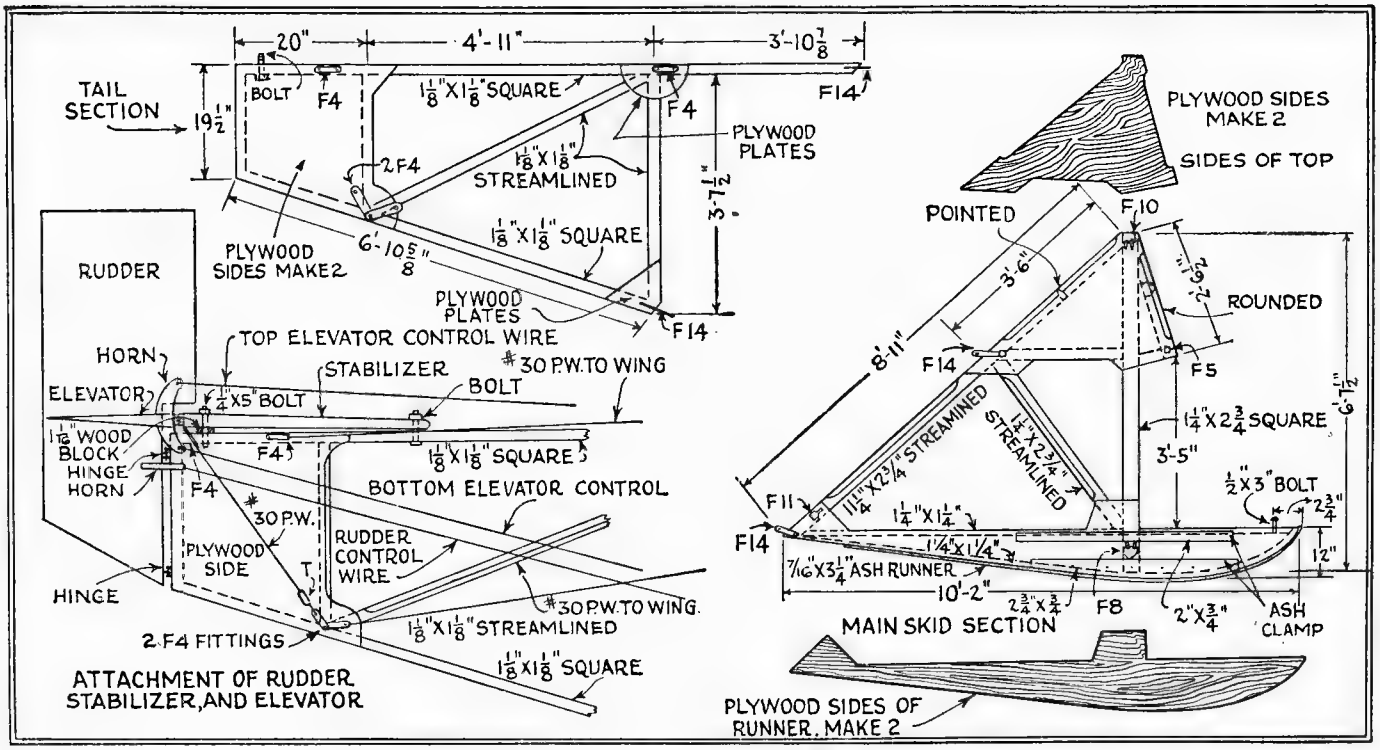
In the first article of this series (published in the February issue) the wing framework was explained.

The present article takes up the construction of some of the main framework, to which the wings are attached. A primary training glider is usually made up in four removable sections: (1) The Wings. (2) The Rudder Section. (3) The Tail Section. (4) The Main Skid Section.

The Rudder

THE rudder is built first and is supported chiefly by a main spar of ½" x 2¼" spruce. Spruce battens ¼" x ⅝" are fastened to this main spar by nailing and gluing triangular plywood gusset plates at the different points of attachment, as shown in the rudder drawing. Short cross-pieces are nailed and glued between these battens, to give the back part of the rudder ribs strength and regular shape, as shown in the top view of the rudder drawing. Triangular spruce blocks, somewhat wedge-shaped as to thickness, are fastened in like manner between these battens at the trailing edge. The trailing edge is next fastened with glue and nails to the ends of these battens and the triangular spruce blocks. Short strips of muslin can be glued to each batten tip and around the trailing edge to further strengthen these joints. The trailing edge can be planed to a slight taper at its back edge to give a knife-edge appearance to the trailing edge of the rudder.

A plywood top is cut to shape and glued and nailed to the top rudder rib. Three plywood tops are cut to shape for the front section of the next three rudder ribs. The front section of the top plywood-covered rib may be used as a pattern for marking these. They are attached as shown in the rudder drawing. A ½" half-round piece of spruce 24¼" long is next glued and nailed to the front of these four top rudder ribs as a leading edge. Muslin strips should be glued around these leading edge joints also. The bottom two rudder ribs end at the rudder spar in front. One horn is attached in position as shown in the rudder drawing. This can be reinforced with plywood triangular gusset plates and spruce blocks to make it very secure. One metal fitting F. 12, is bolted with ¼" machine bolts to the rudder spar, as shown in the drawing. No. 30 piano wire, with inexpensive 5 and 10-cent store turnbuckles, are next installed and tightened to slight tension which will give the rudder rigidity. A 1" half-round spruce strip is next glued and



Here are construction details of the elevator, stabilizer and rudder in the primary training glider built by Lieut. H. A. Reynolds, and also the method by which the parts are attached to the frame of the craft.

Step *Construction!*

IN the first article of this interesting series—published in the February number of SCIENCE AND INVENTION—Lieut. Reynolds described the construction of the wing framework. The third article in the series will cover controls, launching hook, and control connections. It will appear in the April issue.

nailed to the bottom tip of the rudder spar. This strip is tapered to shape at the trailing edge and fastened by using triangular plywood gusset plates. Muslin strips can also be glued around this to strengthen its attachment. Two rudder hinge bolts are now bolted through the rudder spar, in the position shown in the rudder drawing. The rudder framework is now finished, and it can be laid aside until it is next needed to mark the position for drilling the hinge positions in the tail section.

Elevator and Stabilizer

THE elevator and stabilizer surfaces are usually left permanently fastened to the top rear of the tail section, but if their removal is necessary, it is accomplished by simply remov-

(*Continued on page* 1041)

Lieut. Reynolds' father, G. W. Reynolds, appears in this view of the main skid section of the glider.

Bird-houses should always be attached firmly to the trunk of a tree so that they will not have a motion of their own. It is useless to put a bird-house on a thin pole standing in an exposed position. A house in such a location is never used by birds. They do not like a rocking house.

Prepare to Welcome Feathered Friends

By Dr. E. Bade

ONLY a few months ago the forests and woodlands were charming for a short time as the autumn sun caressed the gayly painted leaves. The foliage of the birch and poplar, aspen and cottonwood were brightly yellow; that of the oaks presented all the various shades from yellow and orange to fiery red; the maples assumed a far deeper red; the poison ivy deep yellow along the veins with the rest of the leaf varying from bright red to dark brown. The sumachs glowed with scarlet colors, while the Virginia creeper seemed to be consumed with an inner fire. Day by day, as the night frosts continued their unsuspected ravage, more of the leaves of tree and shrub and bush fell gently to the earth, until, at last, the slender twigs alone lifted their waving arms towards the sky. Then, indeed, the forest became a lonesome place. The migratory song and other birds had long since gone South—only a few of the permanent birds and some wanderers were still to be seen. The cold and unfriendly season did not send them away. It had no terrors for them. There was still plenty of food to be found for the diligent searcher. Many weed seeds and seed capsules and even carelessly hidden insects sufficed for the food of the few remaining birds.

But when the snow begins to fall and cover everything with its soft down coverlet, that is the time of trial and tribulation for the feathered folk. Food cannot be found and shelter is taken in any available crevice, which, unfortunately, is too seldom ever left again. Or the birds seek their accustomed sleeping-places in their favorite tree. But here, during the night, the weak foot gradually looses its grasp upon the twig until, at last, the bird, exhausted, drops down to the snow below, which soon covers and hides the little body.

Then food should be provided for the birds. Giving it to them at other times tends to draw them from their natural inborn occupation of seeking their food, which, if they are not fed by us, gives them the necessary exercise to maintain the heat in their little bodies.

Under the ordinary methods of feeding, the common, imported English sparrow is the only bird that is favored. The really useful birds are seldom benefited. In order to help protect and feed our useful birds the characteristics of the bird must be taken into consideration. Of prime importance is the location of the winter feeding-place, which must be as protected as possible. If such a natural place is not available, then one must be made. This usually (*Continued on page* 1036)

Bird-houses may be as ornamental as desired, as long as they are adapted for the birds that are to use them. For those birds that build nests in holes of trees, the house should be patterned after a tree trunk. Photo immediately above represents a robin-house.

Bluebirds like their homes in the top of a tree. A piece of tree-trunk hollowed out and covered makes an abode for these birds.

LINDY *Gets New Wings*

Colonel and Mrs. Charles Lindbergh, equipped with heavy flying suits and carrying a camping outfit, made an inspection trip along the lines of the Trans-continental Airport. Following this, Lindy took delivery on his new "Bullet" plane.

Lindy's new plane, a Lockheed low-winged monoplane, is capable of flying more than 4,300 miles at 160 miles an hour without landing. Its stream lining is remarkable.

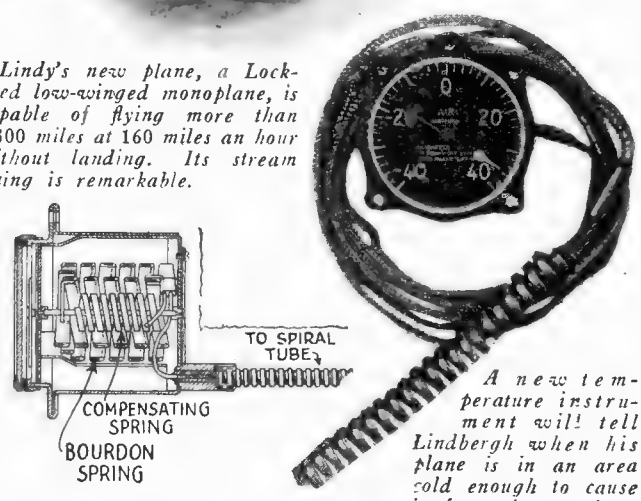
WHEN Charles Lindbergh reached France on his epochal trans-Atlantic hop, he made the word "WE" famous. At that time "WE" meant the plane and himself. Now "WE" refers to the Lone Eagle and his mate, and the newest Lindbergh plane and has added equipment in the form of many new instruments that did not appear on his historic ship.

The new Lindbergh airplane is a two-place "Bullet," built by the Lockheed Aircraft Co. Tests have indicated that this plane can travel at a speed of nearly 200 miles an hour. The ship is a monoplane of the low-winged type and is reputed to have the longest cruising range of any pleasure craft. It is capable of flying 4,320 miles at a speed of 160 miles per hour without a landing. This is roughly equivalent to the distance from New York to Berlin, via Paris, plus 300 additional miles.

The instrument board presents a variety of meters and dials. On the top row of the main instrument board, left to right, as it appears on this page, are the fuel-level gauge from gravity tank, the air speed indicator, the bank and turn indicator, the rate-of-climb indicator, and the fuel-level gauge for main tank. The three small instruments on the left, reading from top to bottom, are the oil pressure gauge, the oil temperature gauge, and the fuel pressure gauge. The bottom row of instruments are the fuel flow meter, the tachometer, the magnetic compass, the altimeter, and a clock. In the extreme lower right-hand corner we see the ice-warning indicator.

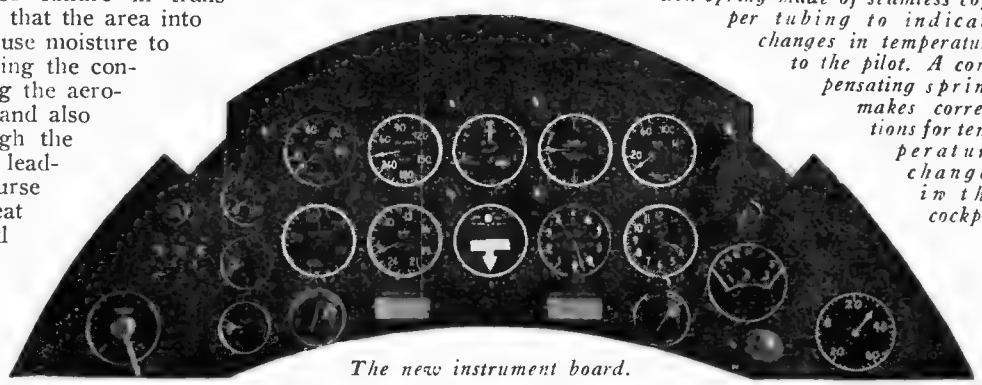
The ice-warning indicator is a very important piece of apparatus for long-distance flights. Formation of ice on the wings, struts, wires and controls of an airplane has been suggested as a causative factor of failure in trans-oceanic flights. If a pilot knows that the area into which he is flying is likely to cause moisture to freeze on the wings, thus changing the contour of the wings and decreasing the aerodynamic efficiency of the plane, and also causing an increase drag through the deformation of the air foil at the leading edge, he can change his course and avoid the danger. No great concern is felt over the increased weight that such ice produces because most planes operate with less than capacity load and are often relieved of much of

(*Continued on page* 1054)



A new temperature instrument will tell Lindbergh when his plane is in an area cold enough to cause ice formation on wings.

The ice-warning indicator consists of a spiral tube attached to the leading edge of a wing or to a strut. A flexible tube runs to the instrument on the dash. The tubes are filled with xylene, a liquid, under pressure. Within the instrument there is a Bourdon spring made of seamless copper tubing to indicate changes in temperature to the pilot. A compensating spring makes corrections for temperature changes in the cockpit.



The new instrument board.

Awards Made *in* $250.00 "Buzz Saw" Contest

By Dunninger

Albert G. Illich, first prize winner, is Vice-President of the Bronx Chamber of Commerce and has been interested in magic in an amateur way since his eighth birthday.

THE Buzz Saw Illusion Contest was a success in every way. More than 10,000 worthwhile entrants sent in what they considered to be the most practical working methods. Lack of space prevents me from presenting many of the interesting high lights in this contest. Suffice it to say that the task of awarding the prizes was stupendous. I present herewith the list of prize winners and the text of the first prize winner, and wish to thank the many fans of magic for their interest and support.—*Dunninger.*

Mr. Illich says of himself:

"I am thirty-five years of age and was born in the Bronx. I was commissioned in the army after competitive examinations and was the youngest staff officer in France. I then engaged in real estate business and am considered to be an expert. I am vice-president of the Bronx Chamber of Commerce, the third largest in the world. Since I was eight years of age I have been interested in magic in an amateur way and have invented several tricks and illusions which I have never seen used. I am a constant reader of* SCIENCE AND INVENTION *magazine and, most of all, like Dunninger's department. I think he has done more to interest and keep people interested in magic than anyone in the business."—A. G. Illich.

MORE THAN $250.00 IN PRIZES

First Prize—$100.00—Albert G. Illich, 3869 White Plains Ave., New York City.

Second Prize—$50.00—Bert Sollander, 1025 South New Hampshire St., Los Angeles, Calif.

Third Prize—$25.00—Bill Coney, 401 Haight St., San Francisco, Calif.

Fourth Prize—$10.00—Nelson C. Hahne, 144 Bank St., Dayton, Ohio.

13 Fifth Prizes—$5.00 each.

Al Douglas, 1215 Park Ave., New York City
Walter Smith, 1911 Cullom Ave., Chicago, Ill.
S. B. Lewis, 125 Pine St., Fitchburg, Mass.
Stan Leyl Judd, 120 Albany Ave., New Britain, Conn.
Carl E. Pedersen, 624 Dartmouth St., San Francisco, Calif.
Carl Petrini, 3922 North Clark St., Chicago, Ill.
Albert H. Miller, 436 Stokes Ave., North Braddock, Pa.
Derrick P. Rusden, 125 Butler Ave., Providence, R. I.
F. A. Seymour, 51 Manor Road W., Toronto 12, Canada
Edward M. Heyman, 234 N. Jersey Ave., Brooklyn, N. Y.
F. H. Dean, 6342 Belmont, Dallas, Texas
Henry Schullermann, 1141 Glenmore Ave., Brooklyn, N. Y.
Bertha L. Johnston, Masten, Pennsylvania
Clifford M. Griffin, 2100 S. College Ave., Grand Rapids, Mich.

The following were awarded 25 sixth prizes, consisting of a year's subscription to SCIENCE AND INVENTION Magazine and an autographed copy of Volume III, "Popular Magic and Card Tricks," by Dunninger.

Dr. Clifton, New York City; Wilfred Beckmen, Montreal, Canada; Roger M. Johnston, San Dimas, Calif.; C. A. Bauer, Portland, Ore.; Victor Gard, Rossville, Ind.; Robert C. Edgerton, Rocky Mountain, N. C.; John P. Pappas, Bridgewater, Mass.; U. Bradner, Hamilton, Ohio; J. O. Seahorn, Hot Springs, Ark.; Arlie Markley, Jordan, Mont.; Jack McKenzie, New York City; Frank Frumviller, Detroit, Mich.; Robert M. Bennett, Downers Grove, Ill.; Rev. William B. Richmond, Bell, Calif.; F. S. Gustafson, Cleburne, Kansas; John Maker, Detroit Mich.; Earl Bernin, Chicago, Ill.; Emil S. Johnson, Wilkinsburg, Pa.; Michael Stacho, Cleveland, Ohio; Fred Brode, Jr., Jersey City, N. J.; Sam J. Black, Mile Seven, Alaska; George T. Conner, Dallas, Texas; Edwin Holt, Atlanta, Texas; Raymond S. Brown, Columbus, Ind.

The First Prize-Winning Entry

WHEN the casket is closed, the lady releases her hands by contracting her muscles and sliding her hands out of the shackles, which are sufficiently large. Her feet are withdrawn from the boots which have been stiffened with wire frames, to retain their form.

She now moves her body to the back section of the box, where she adjusts herself comfortably, aided by a trap cut in the back section, pushing outward and rendering additional room.

A loose board, hinged to the bottom of the box lined with metal, is pulled into position, and acts as a protecting shield. The girl adjusts her body so as to allow the three swords to pass her in entering their respective cavities.

With all arranged, the buzz saw can now pass through the box, with the girl comfortably protected.

Readjusting the trap, replacing the protection board, adjusting the shackles, and replacing her feet into the boots, everything is now ready for inspection at the finale.

The casket should be lined with black flannel or felt to make the working parts invisible and noiseless.

Editorial note: Mr. Illich's solution, in Mr. Dunninger's opinion, is the best workable method of performing the trick, submitted in this contest. What is still more remarkable, the solution is very similar to the manner in which the illusion is actually produced.

Dunninger checked over the solutions in the Buzz Saw Illusion Contest with Mr. Arthur H. Lynch, Editorial Director.

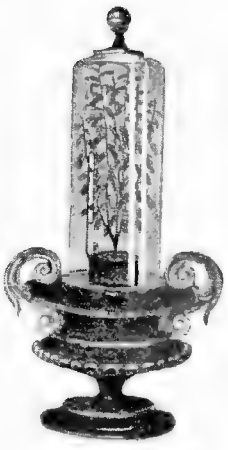
Is It Going to Rain?

Peculiar Instruments Intended to Show Weather Changes

The Camphor Barometer is now a rarity. A glass vial at right has a solution of camphor and alcohol with crystals of saltpeter and sal ammoniac. Height of lower flaky part is asserted to indicate the weather. At the left is a thermometer. It is of no value.

The Weather House with Jocky and Jenny is the most familiar indicater.

"Peace to the artist whose ingenious thought
Devised the weather house, that useful toy!
Fearless of humid air and gathering rains,
Forth steps the man—an emblem of myself!
More delicate, his timorous mate retires."
—Cowper.



The Weather Plant is a member of the pea family—"Abrus precatorius." Its leaves and stems asuming different positions are fantastically alleged to predict not only storms and weather changes, but also earthquakes!

CRUDE contrivances, supposed to indicate coming weather changes —and in some cases, earthquakes and mine explosions—have been popular for ages. Although Uncle Sam's Weather Bureau uses a great variety of instruments, none of those herein illustrated are included. Yet every one of these unofficial and non-scientific devices is designed for predicting the weather.

In the Rathaus at Rothenburg, Bavaria, there has hung for centuries a chandelier bearing a female figure, which turns one way in damp weather and another in dry. These movements, which result from variations in atmospheric moisture, are due to the twisting of a hempen rope by which the chandelier is suspended. The same principle is embodied in the most familiar of all weather toys—the weather house. In this house a string of twisted catgut supports the figures and causes them to swing in and out as it absorbs or loses moisture. Weather houses were made by Jacob Leupold, of Leipzig, as early as 1720, and there is reason to believe that they were known several centuries before his time. The twisting of a catgut string with increase of moisture causes it to shorten, and this property is utilized in another ancient weather indicator—the Capuchin—whose head is hooded in damp weather and bare in dry.

Most non-scientific weather instruments are merely crude hygroscopes, which indicate whether or not the air is well supplied with invisible water vapor. Though many of them are described as "barometers," they do not, like the true barometer, measure the pressure of the atmosphere. Whatever value they possess as weather prognosticators depends upon the fact that an increase of atmospheric moisture points to a probability of rain and a decrease to the likelihood of a dry spell.

Besides these devices in which movements are due to variations of moisture, there are some in which color changes occur, whose action is chemical. In these the sensitive part consists of paper treated with substances that cause it to assume different colors according to the degree of humidity. Generally the principal ingredient is cobalt chloride. When dry it is blue in color, changing gradually toward pink with increase of moisture. These chemical hygroscopes are made in a number of fanciful designs, including flowers, landscapes and the like. In the "Parisian barometer," a girl's paper skirt changes color with the state of the air.

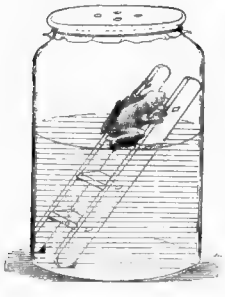
The once popular device variously known as the "camphor barometer,"

(*Continued on page* 1035)

The Capuchin is a little figure of a monk. Inside, a catgut string, by entwisting, draws a hinged cowl over the prophetic monk's head in moist weather, as if to shield him. In dry weather it draws it off his head.

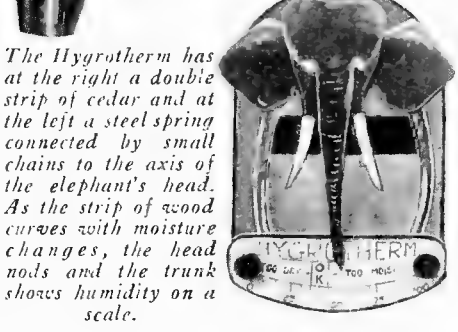
Harold the Lifeguard, devised by P. J. Marschall, is bow-legged when air is dry and straight-legged when damp. One form has a thermometer; the other a removable paddle with humidity scale to place under feet. Distance apart shows humidity.

The Flower Barometer, like the chameleon barometer, varies in color with the humidity in the air, the colors having the same significance.



The Frog Ladder stands in a glass full of water. The prophet is usually a living tree-toad—Hyla arborea. When he climbs to the top most "authorities" say it is a sign of fine weather, but some say just the reverse! Please yourself.

The Chameleon Barometer is a chemical hygroscope using a cobalt salt, which changes color from blue to pink with increase of atmospheric moisture. The significance of the colors is shown by three tinted sectors in the margin.



The Hygrotherm has at the right a double strip of cedar and at the left a steel spring connected by small chains to the axis of the elephant's head. As the strip of wood curves with moisture changes, the head nods and the trunk shows humidity on a scale.

Jumping Motorcars

Is the Schneller Plan for Jumping Motor Cars Scientifically Sound? Write Us a Letter Telling Us What You Find Wrong with It. We Will Pay $10.00 for the Best Letter (Maximum 100 Words) We Receive.

YOU won't need an airplane to cross the Grand Canyon—you won't need a bridge across the Niagara Falls—if the fantastic scheme of the German engineer, Schneller, can be made practicable.

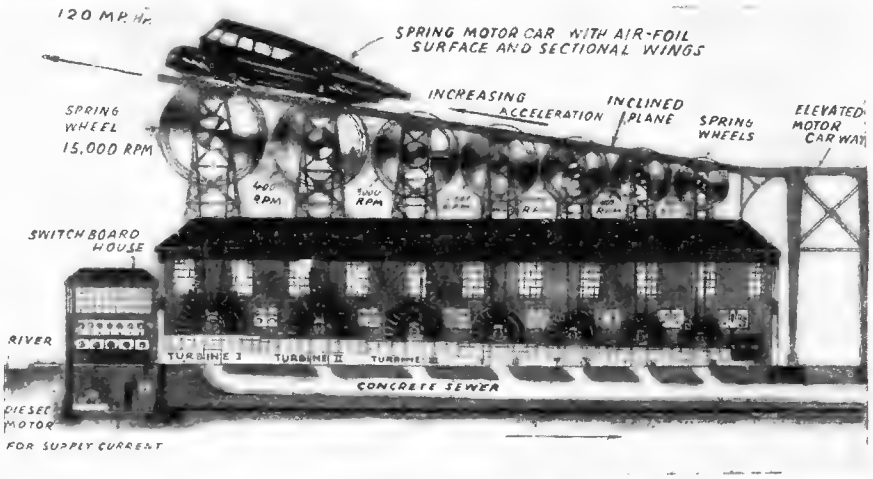
For Mr. Schneller has devised a jumping motor car, whose use would eliminate bridges over gorges and rivers. The motorist would merely drive up an inclined take-off and make a parabolic flight to the opposite side. Naturally, his speed would be far greater than he could make it in a present-day automobile.

Hydro-electric stations are found on all our medium and large sized watercourses. According to Schneller, merely utilizing the superfluous power of the turbines now in use would do the trick.

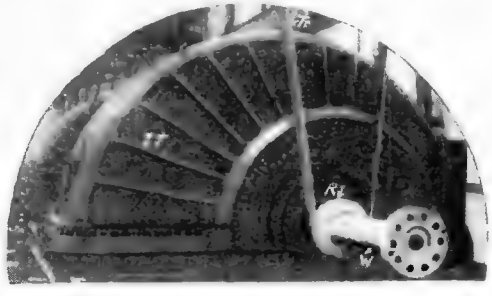
Following the Schneller plan, the car takes off from the inclined plane at a velocity of 120 miles an hour. Acceleration is provided by rotating wheels, which form the surface of the incline. These are driven by individual belts connected with the shaft of the turbines. The speed of the wheels increases steadily toward the taking-off point, and the car leaves the incline at lightning speed.

A small compass mounted in the tower of the vehicle provides steering accuracy in the air. A 1000 horsepower high speed engine, located above the rear axle of the car, furnishes the necessary impetus. When the car reaches the inclined plane, the engine is automatically stopped, and the rollers alone propel the car.

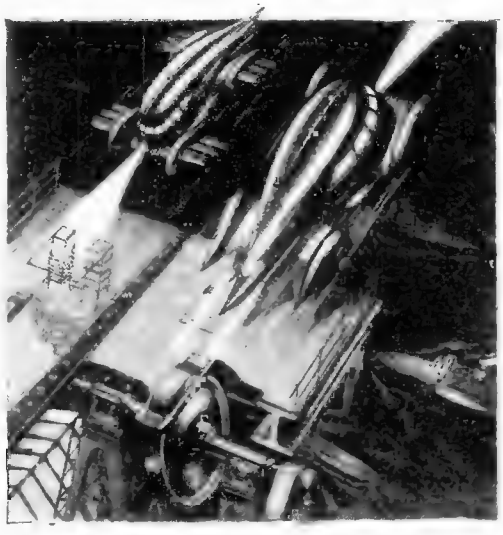
At the highest point of parabolic trajectory, the motor of the car again comes into action and forces out six small divided wings on both sides. These retard the rate of descent. When the car lands, a two-cored electrical magnet built into the roadway automatically acts as a gate or block signalman, halting the car. To provide further safety, forty-eight India rubber-oil shock absorbers come into action the second the car reaches the ground. To prevent collision, there is a strip of heavy grass between the two motor car tracks.



According to the engineer's plan, the rollers forming the roadway are driven by belt from hydraulic turbines. Do you find this plan feasible?



Here is one of the giant turbines which will power the spring wheels of the driving platform. The driving belt is connected directly with the shaft.

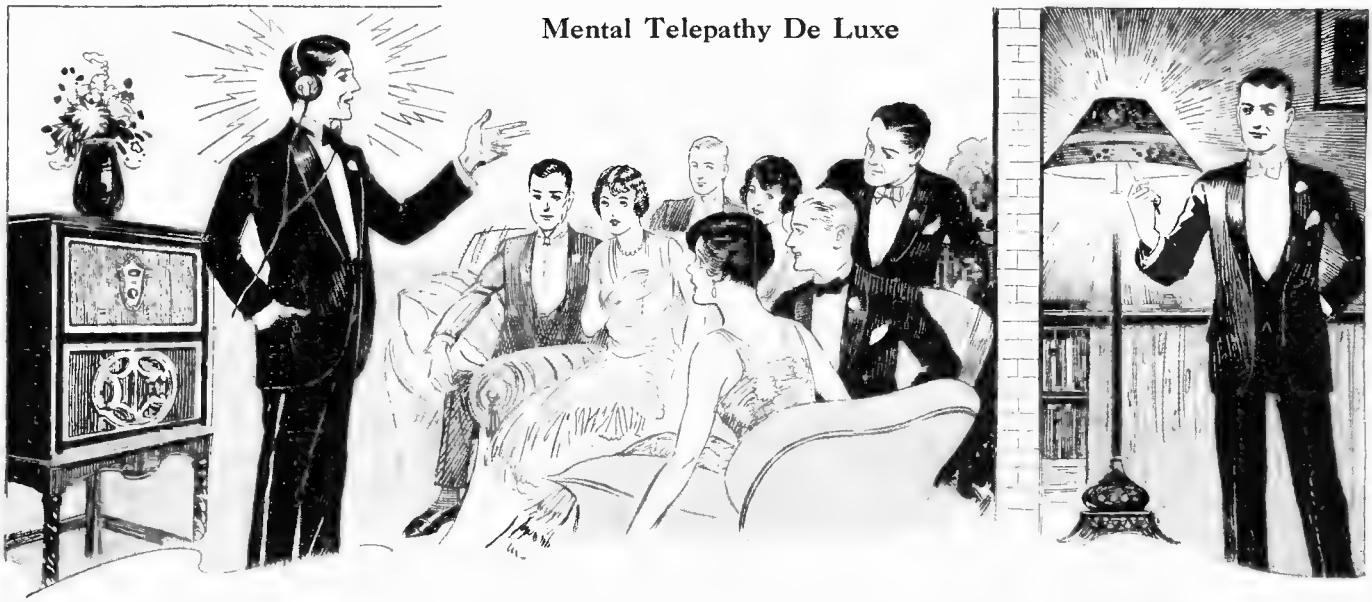


In Germany, one of these jumping car units has already been set up. An old hydro-electric station serves as the base for necessary equipment. If experiment proves the project workable, there is a possibility that similar equipment may be constructed in the vicinity of other hydro-electric stations.

Mr. Schneller thinks his plan for inclined tracks and cars suitable for the United States. We believe the entire scheme fallacious. What do you think? For the best letter sent in, telling the weak points of this jumping motor car plan, as illustrated, we will give a $10.00 prize. The letter must be limited to 100 words.

The cars would land and take-off at lightning speed. A magnet placed beneath the roadway would retard the speed of the cars as they land.

Mental Telepathy De Luxe



THIS exceptional trick in thought transference can be presented as an impromptu demonstration, with absolutely no prearranged paraphernalia. The wizard explains that he can use a radio to demonstrate the possibility of broadcasting thoughts over the ether. The loud speaker is disconnected from the set and the earphones are attached. The assistant who is to partake in this demonstration is now led to another room, and after a committee has been chosen they impart a word and the name of a playing card to this assistant, who naturally is stationed at a fair distance from the performer. The committee return to the radio chamber, and after a few moments are amazed to find that the magician is in possession of the secret name or card.

Explanation:. Anyone who has experimented with radios knows that if an electric switch be turned on or off in another room a click or sound is distinctly heard. A code is prearranged and the trick is done.

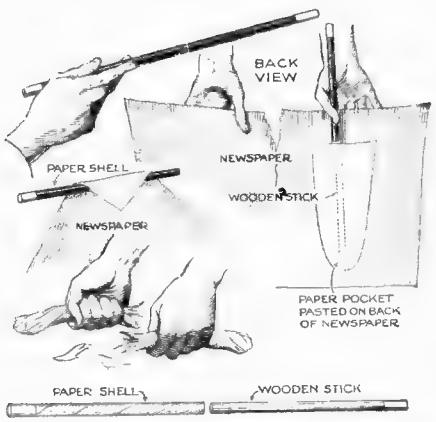
MAGIC

By Hennneger

No. 79 of a Series

Wand Vanish De Luxe

THE effect: The magician proves the wand that he has been using to be solid and apparently unprepared, by giving it a few violent raps upon atable top. Taking a sheet of newspaper which has been hanging across the back of a chair, he tears the paper in two and proceeds to wrap the wand snugly into one of the sections of the paper. Without any suspicious moves he nonchalantly tears this paper into small sections, the wand having completely disappeared.



The secret: The wand consists of a wooden stick, concealed within a piece of paper tubing, which has been painted to represent the genuine article. In the act of tearing the newspaper in two, the solid stick slides from out the tube into a newspaper pocket which has been pasted in back of the paper. Thus, the paper tube which, to all appearances, is the solid wand, is rolled into the newspaper which is afterward torn to bits.

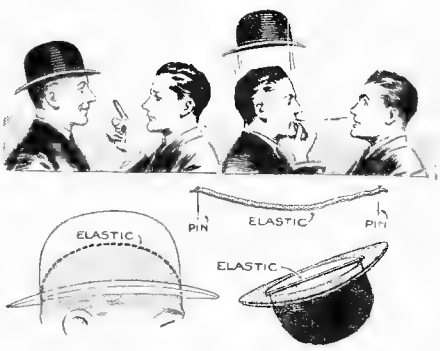
The Phantom Derby

THE magician enters a room, and for a moment shocks the ladies by neglecting to remove his hat. Seeming to be somewhat embarrassed, the wizard places his finger to his mouth, and blows upon it. Instantly, the derby leaps off the magician's head, flying into the air.

An examination of the hat is sure to be called for. The spectators, however, are greatly amazed to find the derby is entirely unprepared.

Secret: Two plain pins and a piece of elastic is all that is required. A pin is tied firmly to each end of the elastic. Stretching the elastic, the pins are driven directly opposite one another into the band of the hat. The derby is then placed upon the head, as illustrated. The hat should fit rather tightly. In the act of blowing the finger, which is merely a bit of by-play, the wizard has but to frown, thereby relaxing the muscles of the forhead, which produces sufficient slack to cause the hat to fly upward, and offthe conjurer's head.

All that remains to be done is to remove the pins and elastic secretly.



Enchanted Goblet

THE wizard brings forth a large, transparent glass goblet. This container is seen to be filled with milk.

The magician then borrows a handkerchief, which he throws over the goblet, and places it on a table. To the amazement of the spectators, the goblet is brimfull of wine when kerchief is removed.

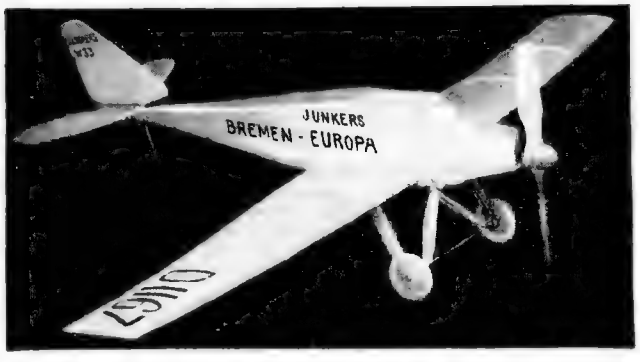
The goblet is a specially prepared one, with hollow stem, and an inner glass lining. Some milk is poured in through the stem, while the glass is inverted. A cork prevents the milk from leaving. The inner lining is filled with wine, concealed from view by the milk in the outer shell. When covering the goblet with the handkerchief, the cork is secretly removed, and the forefinger pressed over the hole.

The glass is placed over a trap in the magician's table, the inside of which contains a tin cup, into which the milk freely flows, while the goblet is still covered.

Build and Fly this Model "BREMEN" *Plane*

Veteran of Trans-Atlantic Voyage Lives Again in Model Form. Complete Details for Construction and Flying Given in These Pages

By Armour F. Selley



Here is the "Bremen" model constructed by the author himself. It flies, too!

WHETHER you're fifteen or fifty, there's an awful lot of fun in store for you in building this new model airplane. Remember the famous Junker plane —the *Bremen?* Of course you do. Remember the two German noblemen and the brave Irish Captain Fitsmaurice, who attempted a flight to America from Germany? And of course you remember that after almost three thousand miles of flying through the most difficult weather conditions, the plane was finally forced down on a tiny fishing island off the coast of Labrador. Well, now you can build the same ship which made this wonderful voyage, in miniature of course, *and actually fly it.* Follow these plans, our blueprints and our instructions, and you will have no difficulty in making this scale model of the famous Junker *Bremen* plane.

The first thing to do if you purpose to construct this plane is to carefully read over the directions given below and to study very carefully the "Key to Parts," whose numbers correspond with the numbers on the opposite page. All the component parts for the construction of this plane are available in kit form, but if you desire to do this part of the work yourself you will find the instructions complete enough to do so. And our parting shot, before we hand you the construction details, is that you use ambroid for cementing purposes. It is much neater and much more satisfactory than common glue.

Fuselage

THIS is constructed by joining together the two formed sides supplied in the set. Compression struts (3) should be carefully cut away according to the dotted lines on the drawing, to reduce weight. Also enlarge the drilled holes in anchor plate (12) to lighten the weight. Join the cross struts (7) and cabin brace (14) to fuselage sides with model nails. When all cross members are in place, coat each joint with ambroid, square up assembly and allow to dry. Form cabin roof (15) according to drawing and bevel front edges. Fit and glue it into place, bracing front point with cabin brace (13) as shown. Cut out two celluloid windows according to template (16). Bend to form a right and left window and glue into place.

Cut nose piece (1) according to template. File out 1/8" notches at the corners for longeron seats and at the top of center hole file a 1/4" square socket to take propeller hanger (19). Drill two 1/32" holes for wire clip (26). Apply ambraid to front fuselage struts and longerons and set nose piece into place.

Fit and glue reinforcement pieces (11) in place to form wing spar socket spaces (9) and (10).

First drill and file out hole in rear motor stick support (4), then glue to upper and lower horizontal cross struts.

Tail block (5) is supplied with two holes for stabilizer (35). Drill an 1/8" hole at right angles to the others, as shown in Fuselage, Top View, of drawing. This is to accommodate tail skid (41). Taper block to fit between the longerons and nail as well as glue into place.

Covering: Outline on bamboo paper with a pencil the side to be covered and cut roughly to size. Apply white glue to the longerons, attach paper evenly and trim. Cover first the bottom, next the top and then the sides.

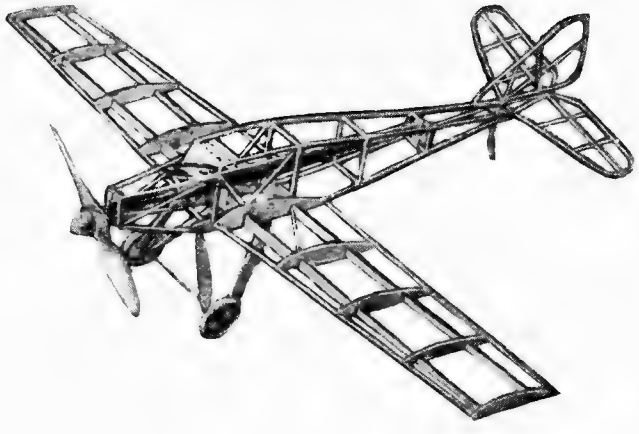
Doping: Apply coat of dope, thinned according to directions.

Motor Unit

THIS is a separate unit, built so that it may be removed from the fuselage. Stick (21) should be cut to the exact length of drawing and reinforcement pieces (24) and (25) attached to each end with ambroid. It is important that the rear reinforcement pieces (25) are placed exactly as shown, in order to form a stop against the rear motor support (4). Drill a 1/16" hole in motor stick for motor hook (23). Insert and bend as shown. Square front end of stick to fit propeller hanger (19). Insert wire through hanger and form wire clip (26) to fit the two 1/32" holes in nose piece (1).

Carve propeller (17) according to directions and attach spinner with glue. Hold propeller in place on shaft (20) with small wood screws (44), inserted through the flange. With spacer bushing (27) in place, insert shaft (20) through hanger (19).

This skeleton view of the "Bremen" model plane shows the simplicity and soundness of its design.

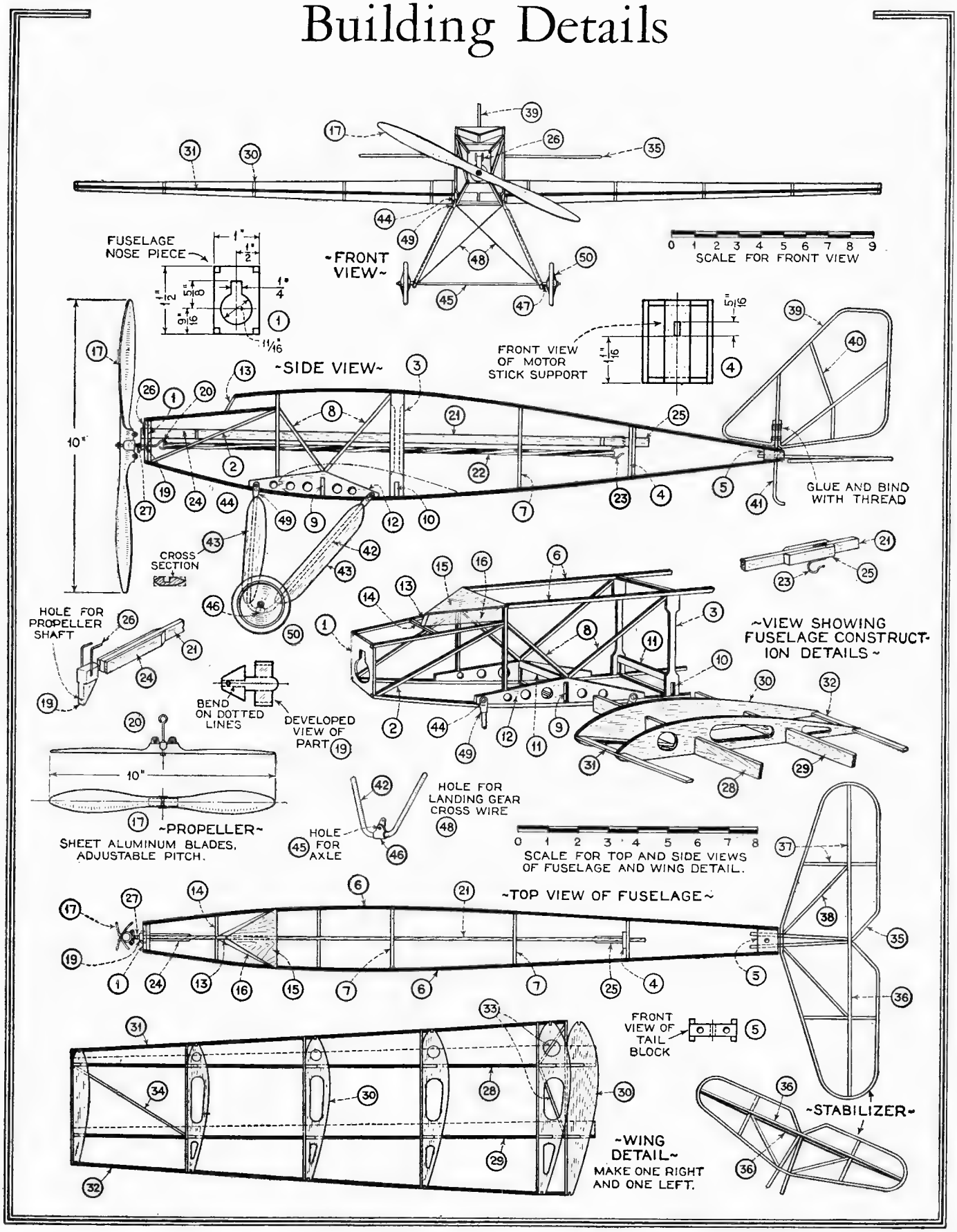


Use a motor of 12 or 14 rubber strands, depending upon the weight of the model. This must be determined by test flights. Loop rubber evenly before attaching to hook (23) and propeller shaft hook (20).

Now that the fuselage has been considered, the motor unit taken care of, let us turn our attention to the landing gear.

(*Continued on page* 1051)

Here Are Simple and Complete Building Details

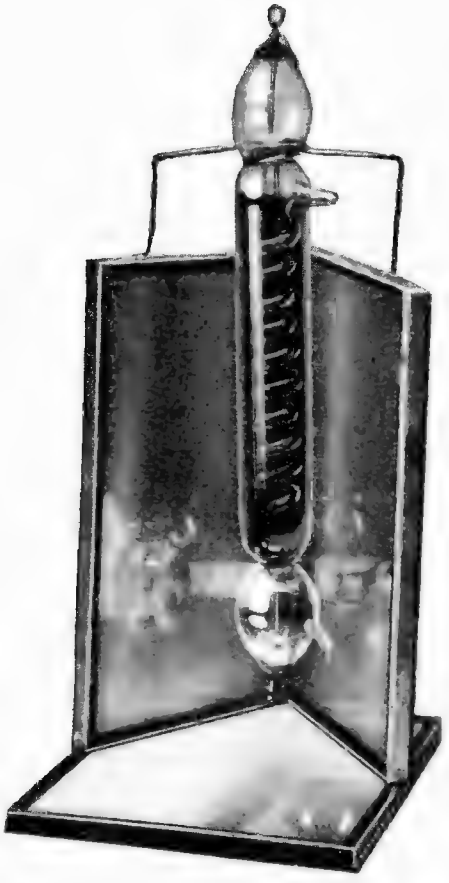

~FRONT VIEW~
SCALE FOR FRONT VIEW
FUSELAGE NOSE PIECE
~SIDE VIEW~
FRONT VIEW OF MOTOR STICK SUPPORT
GLUE AND BIND WITH THREAD
CROSS SECTION
HOLE FOR PROPELLER SHAFT
BEND ON DOTTED LINES
DEVELOPED VIEW OF PART
~VIEW SHOWING FUSELAGE CONSTRUCTION DETAILS~
~PROPELLER~
SHEET ALUMINUM BLADES, ADJUSTABLE PITCH.
HOLE FOR AXLE
HOLE FOR LANDING GEAR CROSS WIRE
SCALE FOR TOP AND SIDE VIEWS OF FUSELAGE AND WING DETAIL.
~TOP VIEW OF FUSELAGE~
FRONT VIEW OF TAIL BLOCK
~WING DETAIL~
MAKE ONE RIGHT AND ONE LEFT.
~STABILIZER~

Follow the above drawings carefully. Note the "key numbers"; they are vital to the success of construction. All the material is available in kit form if so desired. Every part is drawn to scale. The top, side and front views are all shown, besides the detail of the wings, fuselage and propeller. The model was built first, the plans were then made, the plane was built according to the plans; so that success of construction is insured.

Have Some Fun *With* Cold Light!

Do You Know How to Make a Lamp Glow—Without Current? Can You Obtain a Light—Without Heat? Read This Article and Find Out How to Perform This and Other Interesting Experiments With "Cold Light"

By Raymond B. Wailes

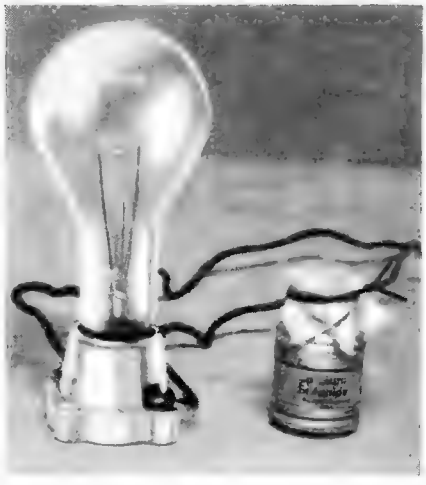


A Geissler tube of the fluorescent liquid type mounted between three mirrors, one horizontal and two vertical, gives fine effects.

LIGHT without heat is almost as inconceivable as fire without smoke. The man who has burned his fingers on a hot electric light bulb or singed those same digits on a kerosene or gas flame knows full well that there is plenty of heat with light. But the twin phenomena of chemistry and biology—phosphorescence and fluorescence have long puzzled and amazed students of the laboratory, for they have found that certain chemical substances—organic and inorganic—will give a varying degree of illumination with a neglible amount of heat. In fact this type of light is the most efficient known, as it does not lose its energy through heat losses. The fascination of playing with these substances in the laboratory or home is enhanced greatly by the remarkable colorations of the light and the scintillating effect of certain crystaline substances. And in addition, the experiments are simple and of moderate cost.

A speck of fluorescein dissolved in water made weakly alkaline with an alkali, such as sodium hydroxide or lye, will cause the water to fluoresce beautifully. If viewed in the dark immediately after exposure to the light it will be found that it no longer glows, or fluoresces, hence it has no phosphorescent properties, for only phosphorescent bodies glow or emit luminesence after the source of light has been removed. Fluorescein can be made to phosphoresce very brightly, however. Heat several crystals of citric acid in an evaporating dish and drop in a speck of fluorescein. Stir with an iron rod. Extinguish the flame and darken the room. The fused mass will phosphoresce brightly with a decided greenish glow. The writer has been able to read print held an inch away from the glow.

Oyster shells and sulphur heated together produce calcium sulphide of the phosphorescent type. All calcium sulphide is not phosphorescent. Only the kind listed as luminous calcium sulphide in chemical price lists should be used for a pretty little experiment which the writer discovered.



A blinking lamp coated with luminous calcium sulphide gives very interesting effects due to phosphorescence.

This experiment was performed with the so-called blinking lamps which light half the time and are extinguished the other half of the time. By making a weak gum arabic solution, or varnish, coating the bulb of the light and dusting on luminous calcium sulphide, the lamp is able to emit light continuously. When the filament is hot the usual light is thrown out. When the blinking button in the base of the socket cuts off the current, the phosphorescent calcium sulphide glows with its characteristic bluish light, of course not as bright as the normal brilliancy of the lamp. The effect is rather novel, particularly when an extra strong luminescing substance is used and the lamp is of low wattage. A cloth can be tied over the mouth of the uncorked bottle of luminous calcium sulphide to make a sifter with which to coat the lamp.

Another curious substance is *salophen*, which can be purchased at drug stores. When a bit of this white substance is crushed or rubbed with a hard object, little flashes of light will be emitted. A few crystals placed in a test tube and another test tube slightly smaller than the first thrust inside the larger tube and rotated, will produce hundreds of little scintillations. This crystal - luminescence is called crystallo-luminescence.

Calcium sulphide coated on a card will soon cease to phosphoresce if taken into a darkened room. If the card is heated, it will begin to glow again. Several different kinds of wire such as copper, iron, brass, etc., laid on the coated card can be used in a rather novel experiment, nicely illustrating heat conductivity. The wires all come together at one of their ends, while the wires themselves are spread fanwise. If the common touching spot of the wires is (*Continued on page* 1050)

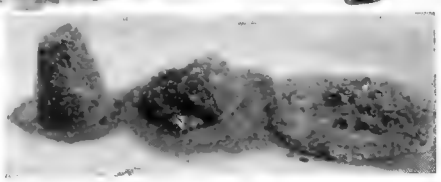
Preparing a fused mixture of fluorescein and citric acid in air-evaporating dish. This mixture gives bright phosphorescence.

Make *that* Wet Cellar Dry

By Josef W. Von Stein

Waterproofing Is the First Step in Making Your Basement a Livable One

The slump test gives a rough idea of the consistency of concrete—and workability depends on consistency.



Here are stiff, medium and wet mixtures of concrete after the slump test.

"SAY, Bill," said Harry, tendering a light to Joe's cigar, "I was telling Joe the other day about the good luck that we had in refinishing our walls."

"I'd like to come over to your home some evening Harry, to see what your refinished walls now look like," said Joe. "Incidentally I'd like to have a look at that watery cellar of yours."

"If you really want to see something rare you ought to see Bill's duplicate of the famous Luray Caverns of Virginia," said Harry.

"Really?" queried Joe, turning to Bill. "Why don't both of you try to waterproof your cellars? I'm having my cellar waterproofed; and believe me, I'm going to get some mighty good use out of this extra floor."

"That's all very well for you, Joe," said Bill. "You're building. But don't forget our homes are already finished."

"Exactly," replied Joe, "and that is no reason why you must tolerate damp or wet cellars. The trouble with both of you is that you don't realize how comparatively simple it is to obtain a perfectly dry extra floor of living quarters.

"I wonder if you realize that air from the cellar is constantly rising through all the rooms of the house. It isn't surprising therefore, that damp or poorly ventilated cellars are generally the direct cause of that peculiar musty odor prevalent in some homes."

As Joe stopped momentarily to relight his cigar, Harry asked, "Do you mean to say that we can transform our cellars into habitable quarters with no outside help?"

"You can—with a little energy—and at a moderate cost. That is, if you aren't adverse to getting a trifle grimy. Of course, there are organizations who will do the work, if you so desire. For example, the other day I had a talk with one of these concerns. If I remember correctly, their name is 'The New York Waterproofing Service.'"

"But when you speak of our doing the work ourselves, Joe, do you mean that Bill's problem is identical with mine?" asked Harry, perplexed. "You know Bill has merely a damp cellar, while I have to wade through a lake."

Joe shook his head. "No. The exact manner of treatment depends, of course, upon the manner and amount of seepage. Remember, though, that the concrete mixture must be of the right consistency. You can be sure of getting definite and concise data on this point from the Portland Cement Association. They've a manual on this subject.

"Generally speaking, there are two distinct ways of treatment. One type entails treatment from the outside of the walls; it is the one I am using. The other type—and the one I believe you will find more convenient for finished houses—entails treatment from inside."

"But I thought that there are innumerable methods of waterproofing cellars." Bill interrupted.

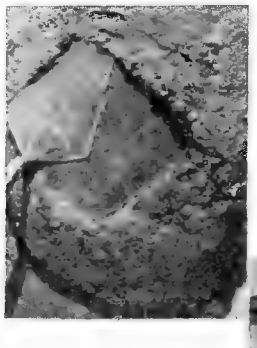
"You mean that there are various different treatments that fall within these two major classifications," corrected Joe. "For example, some methods entail the use of a simple Portland cement mixture applied in various ways; while other treatments involve the use of such mixtures combined with some patented waterproofing compound, such as are manufactured by a number of concerns."

"Do you recommend plain Portland cement or the waterproofing combination," inquired Harry.

"That, Harry, is a matter of personal preference, as far as I have been able to discover," advised Joe.

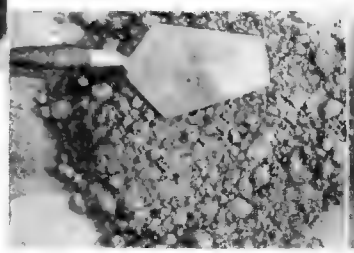
"You might write to the Anti-Hydro Waterproofing Company, and the Sandusky Cement Company who manufacture a full line of waterproofing powders and pastes as well as the well-known 'Medusa' White Portland Cement Company.

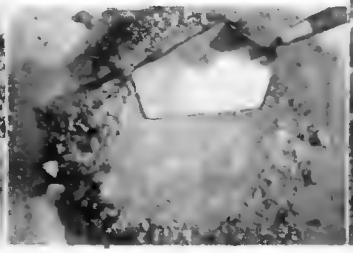
"I, personally, am in favor of three concrete methods. One method I am having applied in my own individual case; another method of treatment is for damp walls; a third method is for cellars having (*Continued on page* 1055)



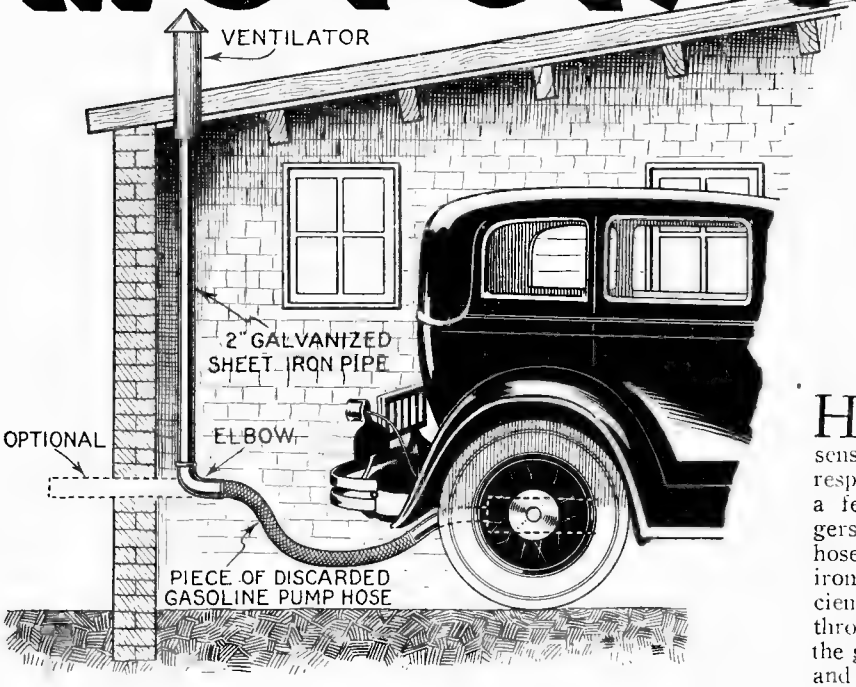
The mixture above shows an excess of cement-sand mortar. The yield of concrete here will be low and probably porous.

The mixture shown at the lower left contains insufficient cement-sand mortar to fill spaces between pebbles; to the right of it is shown a correct mixture—it will give the maximum yield of concrete. On masonry walls with a coarse texture a scratch coat can be directly applied.





MOTOR HINTS



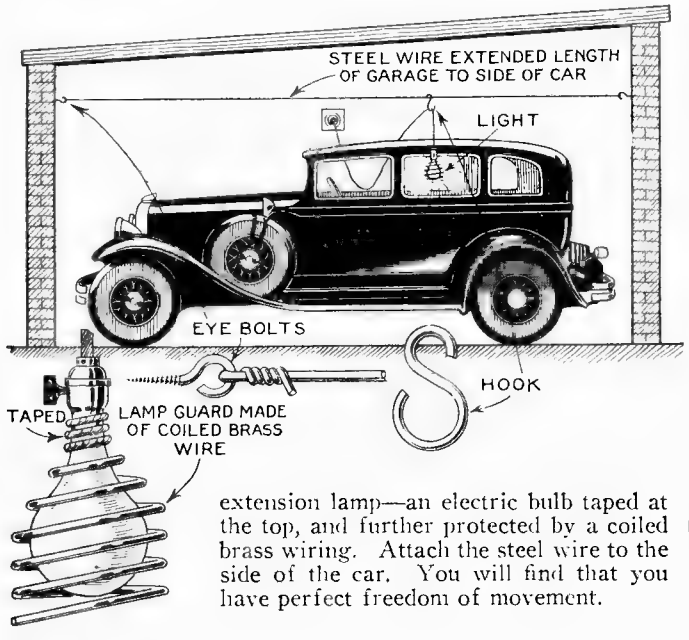
By George A. Luers

Eliminate All Danger of Carbon Monoxide Gas

HAVE you ever worked in your garage for a few hours, and come out with a heavy, dizzy sensation? *Deadly* carbon monoxide gas was responsible for your groggy feeling; yet a few minutes of work will eliminate its dangers. Merely attach a discarded gasoline pump-hose to the exhaust pipe, join to it a galvanized iron pipe (about 2 inches in diameter is sufficient)—and have an exhaust ventilator extending through the roof. A still simpler way is to run the galvanized pipe through the wall of the garage and lead it up to the roof.

Make a Safe Extension Light

WORKING in a dark garage with a fixed light is impossible. The lack of support provided the usual extension light makes it impracticable. Pick up a few odds and ends and fix the extension light so that it will be serviceable into the farthest corner—and safe. Provide a tight wire whose length equals that of the garage—to it attach a hook, adjustable the full length. This hook will hold the

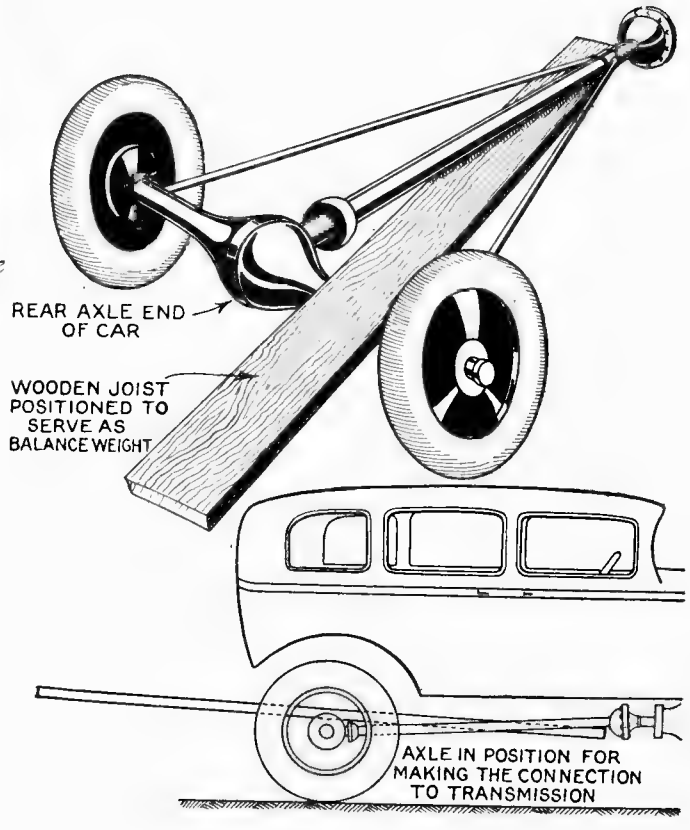


extension lamp—an electric bulb taped at the top, and further protected by a coiled brass wiring. Attach the steel wire to the side of the car. You will find that you have perfect freedom of movement.

DO YOU KNOW—clutch spinning which makes it difficult to engage gears is controlled by the transmission? If light gear oil allows the clutch to spin, a heavier lubricant in the transmission will act as a clutch brake.

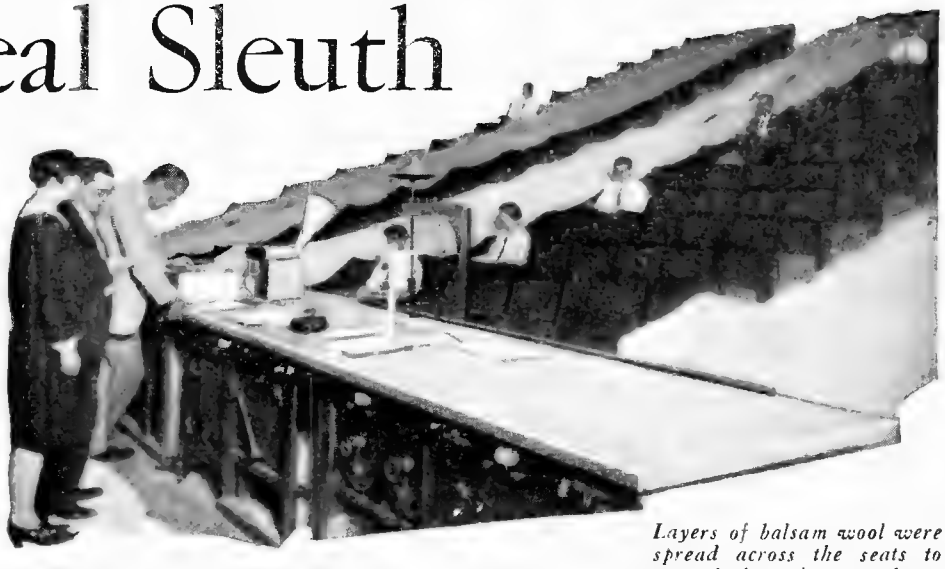
How to Replace the Rear Axle

HOW often we've wished some one would think up a way of connecting the joints at the transmission, while assembling the rear axle. We never realized that a common, ordinary beam of wood serves admirably. Just counterweight the axle assembly with a beam—rest it on the axle housing, one end under the drive tube. Leave enough of the log overhanging to balance. Then you can move the axle assembly readily, and the universal joint connection freely fits into position. One of the most difficult jobs in keeping the car fit will have lost its terrors.


REAR AXLE END OF CAR
WOODEN JOIST POSITIONED TO SERVE AS BALANCE WEIGHT
AXLE IN POSITION FOR MAKING THE CONNECTION TO TRANSMISSION

Sound Detecting Is Job *for* Real Sleuth

By Walter Raleigh



Layers of balsam wool were spread across the seats to control the voice reverberation period, when phonetic experts co-operated in intelligibility tests with Dr. Andree, of the Burgess laboratories. Dr. Andree is at the acoustimeter.

WE fuss and fume over the radio loud speaker, the impatient automobile horn, and the builder's crescendo. Yet no one as yet has invented a method of measuring the volume of noise —a method which would be satisfactory to both scientist and layman.

We need a simple, accurate noise gauge. Our protests have become too much a matter of opinion. The difference between sound, noise, racket and music depends too much on viewpoint and education.

Science has used audiometers to measure sound, but these must be used by trained investigators. No policeman on his beat can pull one out of his coat pocket when he hears a late party making whoopee, and gather data to decide for him whether to make arrests or resume his beat. Moreover, the officer would have to trail the unlucky noise to its source—a task harder than that which falls to a bloodhound. For sound can do phenomenal things!

Sounds have a way of increasing or decreasing in intensity. The pitch of a sound has much to do with the effect of that sound on the ear. A rasping sound of low volume may be more disagreeable than a much louder musical one. To be practical, the portable sound indicator would have to correlate all these factors and give an automatic answer.

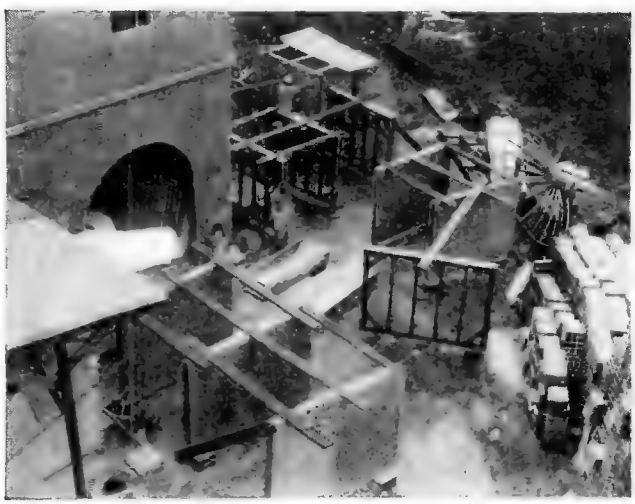
It is not so easy!

Dr. R. F. Norris, of the Burgess

With an iron bar, an oscillator, and a Derby hat Dr. Norris makes musical sounds fill the air.

Laboratories in Madison, Wisconsin, has discovered how sounds carry to unexpected places. Shaft-ways for elevators, dumb-waiters or ventilation devices act as speaking tubes. Even the simple framework of a building, a single joist, can transmit melodies or noise just as a telephone wire can do. And once transmitted, sound travels strangely. A watch can not be heard at a distance of more than eight to ten feet, under normal conditions. But hold the same watch at the end of a long iron or metal rod and it sounds as though it were held to the ear!

Dr. Norris showed us a strange-looking apparatus consisting of a long rod and a Derby hat. At one end of the rod, which was held rigid, he placed an oscillator. The vibrations set up in the rod by this devise resembled those made by the blows of a tiny hammer. At every beat the rod would move a bit away from the hammer and then swing toward the (*Continued on page* 1044)



Modern building science has devised packing by which dance floors are made sound proof. Spaces are left between structural parts to prevent bothersome sound-travel beneath the floor. In pursuit of knowledge about the sound-carrying qualities of building materials, the Bureau of Standards makes and breaks numerous houses like the one shown at the left.

THE SAFETY

Readers' Opinions and Comments

Does Ouija Board Work?

YOUR article in the January issue referring to the subject of the Ouija Board is very interesting.

Some years before the war ended my brothers cut out a piece of cardboard in

the shape of a heart; two matches were put in at each lobe of the heart and a pencil was pushed through the point. The right hand of the two individuals was then placed on the heart and these persons were told to think in unison. We found that if you do not doubt the ability of the instrument, it will answer any or some of the questions asked of it. If you doubt, it will not write out the answers to the questions. When we asked how long the war would last, it wrote out "four years." Many other questions were answered with the same uncanniness. If you doubt my word you might refer to the Reverend Mr. Rogers of Knox Church here who will attest to my veracity.

J. L. FRANKLIN,
Owen Sound, Ont., Canada.

(The construction of the heart-shaped devices which you describe was sold many years ago under the popular name of the Planchette: Some of these Planchettes were equipped with wheels on the two rear legs and a pencil near the point of the heart-shaped wooden plate; others had smooth wood runners. As a general rule, it is a good deal easier to get a tangible message with a Planchette than it is with an Ouija Board and a message can even be obtained when both individuals operating the Planchette are blindfolded. Nevertheless, the statement we made in the previous article still holds in the present case. The Planchette is primarily controlled and operated by one or both of the individuals whose fingers are on the wooden plate. Ask for an answer to a question, to which neither of the operators knows the correct reply, and the Planchette will not operate. Write a message on a piece of paper, seal it in an envelope and then ask either or both of the operators, or the Planchette itself, to answer the query and the Planchette will not function. Neither the Ouija Board nor the Planchette can lay any claim to the performance of things supernatural. They both belong to the same class.—EDITOR.)

Exercise Helps Weak Eyes

I NOTICED an article in the November issue by you to the effect that weak eyes cannot be helped in people over 25 years of age, by the use of special exercise. I beg to disagree with you. I have seen cases of weak eyes helped by exercise and to such an extent they were able to discard their glasses or "eye crutches" permanently. I am not attempting to dispute the fact that eyes impaired by accident cannot be remedied, nor can eyes that are weakened by old age be helped to any noticeable degree, but I do maintain that weak eyes can be improved to a very great extent by exercise, not for the eyes alone, but for the muscles throughout the entire body.

No doubt you are acquainted with the chemical process within the body known as metabolism, which is the tearing down of old cells and building up new cells. That explains why a man who works hard all day doesn't progress in muscular strength. He simply tears down as fast as he builds up, while exercise builds up to a certain point and stops there.

When you say a man over 25 can't improve weak eyes by exercise, you might also say this is true of the muscular system.

It is true the body matures at a certain age, but I have known cases of men developing their bodies into athletes after the age of maturity. The same principle applies to weak eyes which is after all a muscular organ. Let's hear some more about this subject next month.

CHESTER FUIK.
Toledo, Ohio.

(The exception never proves the rule; obviously, any reasoning applied to a man building up the muscles of his body and tearing them down by exercise can also apply to the eye. If metabolism works such hardship on an individual who uses his muscles all day, then that same metabolism works an identical hardship on the eyes, which are used more than any other muscles of the body, with the possible exception of the heart and the diaphragm. We have held that any eye exercise carried on for a period of ten minutes to thirty minutes would be of no material benefit to an individual who then proceeds to make the same mistakes that he has been trying to rectify, over an extended period of twelve to eighteen hours a day. This is particularly true of individuals over 25 years of age who find it necessary to use their eyes, even though the other muscles of their body are sluggishly employed, if at all.—EDITOR.)

A. M. A. Versus Diagnostic Machines

HAVING read your answer to E. Meistirling of Albuquerque, N. Mexico regarding the Radionic machine, permit me to say there is not anywhere in the world a medical man who would use, or advocate the use of any machine such as the Radionic or the Pathoclast machine for the purpose of diagnosing, even though the accuracy of this same machine should be demonstrated to him to his entire satisfaction. Any time an M.D. admits any method or machine, which will help humanity to regain or maintain better health, its origin must be discovered in the laboratories of that profession.

I, as the daughter of a trained nurse, with two sisters trained nurses, can tell you much about the doings of the A.M.A. It is too bad that poor unfortunate sick people seeking health advice should write to you and have you give them advice which you have obtained from men who are directly opposed to anything they have not had a hand in discovering.

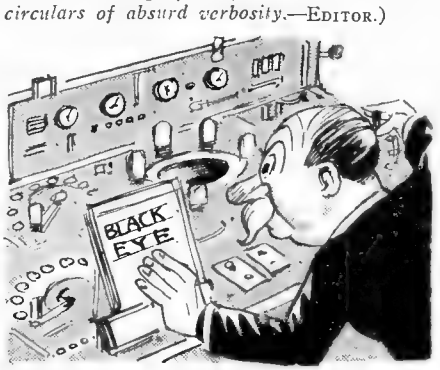
I have had a personal experience with a complete Pathoclast diagnosis, and have gained my health through the advice of the men using the same and the sane and sensible drugless methods of healing. I have spent ten years in following the guess work of the so-called scientific medical profession, but am glad to say I was awakened to the absolute folly of their methods.

I would suggest you investigate, for your own self enlightenment, the subject of diagnosing by the various machines before you give a biased opinion to the public.

ERNA PALMER,
San Francisco, Calif.

(Actual experience has taught us that many members of the medical profession are willing and even anxious to improve on their methods of diagnosis. They will take up any machine which bids fair to become perfect, if not already perfect, and they will develop this machine to a stage of perfection. The medical profession is today using thousands of different devices, mechanisms, appliances and machinery which were not devised by any member of their profession. They would do the same with a diagnostic machine, providing that one were produced that did the work. To recount an experience, this writer was called up by some of the best known medical men in the field, who received the surprise of their lives when a diagnostic machine gave absolutely correct diagnoses in three test samples submitted to the operator of that machine. A second test was arranged by us. On this occasion 24 samples of blood were given and not one correct diagnosis followed. A third test with 12 samples also proved totally worthless. The reason for the latter two failures might be ascribed to the fact that this writer suspected a certain reporter of being closely allied with the sponsors of the machine and ordered him excluded from the hospitals where the test samples of blood were taken.

You may rest assured that SCIENCE AND INVENTION *Magazine for one, will see to it that every diagnostic machine, submitted by inventors, is given a fair test. Such machines should preferably be devoid in their circulars of absurd verbosity.*—EDITOR.)



VALVE

Will Be Welcomed by the Editors

The Imaginary Death Ray

WOULD be pleased to have you advise me what you know about any kind of a wireless device with which a person can shock another severely to the point of death over a considerable distance without coming in direct contact with him or through the use of wires, etc.

That such a discovery as this has been made I am positive. I have heard that the Department of Justice frequently makes use of such an instrument as this in persecuting anyone they are after. An ex-agent has informed me of many startling things that can be done with this device such as covering a person's body with electric burns and blisters, ets., all from a distance. Since I have heard from others of this discovery having been made and have spent some little time trying to obtain information about it, I have little cause to doubt the foregoing.

What I am interested in is in finding out all I can about the matter and being so far away from the States, I hardly know just where to make intelligent inquiries. Inasmuch as I have read many articles of a scientific nature in various periodicals for years that you have written and as you are so well informed on all late scientific matters, I thought that perhaps you might be able to help me.

I make this request because you are in the position to be hearing of new discoveries constantly that I perhaps would never know of, so far away as I am down here.

DR. HARRY E. A. EVANS,
Callao, Peru.

(Periodically in the newspapers throughout the country one will read a story about someone having invented a death ray machine. Such machines are supposedly used for the purpose of destroying enemy fleets and are supposed to produce burns when at a distance from the individual operator of the mechanism.

Nevertheless, every investigation of such claims has proven that the mechanisms do not exist.

About three years ago we conducted a very important investigation into this idea to determine whether a death ray machine could actually be built. We came to the conclusion then that there was nothing known to science today that was capable of projecting a ray which could produce a burn at a distance with the exception of the arc lamp.

Operators exposed to the rays of such arc lamps would get a burn the same as sunburn. Electric burns and blisters cannot be produced by any other agency. X-rays could also conceivably be pressed into the service, but they could not produce any disastrous results at any great distance without the tube being focused on the individual and there is no way known today in which X-rays can be focused. The so-called odic ray and the various other forms of death rays simply do not exist.—EDITOR.)

The Theronoid — the Electrical Health Belt—Again

I AM enclosing some literature on the Theronoid that was sent to me, and I am sure it will interest you and your readers, as it is about, if not the same, as the Ionaco, the device you exposed a short time ago in your wonderful magazine. I am one of your most interested readers.

HOWARD MICHAELSON,
Zumbrota, Minn.

(You are correct in your surmise. The Theronoid is very similar to the Ionaco. As a matter of fact, Mr. Phillip Ilsley is President, Treasurer and General Manager of the Theronoid Corporation, and was at one time employed by Gaylord Wilshire, promoter of the Ionaco. He later operated the Ionaco offices in Duluth, then in Cleveland, after which he split with the Ionaco Company and organized the Theronoid Corporation.

The Theronoid is an appliance in the form of an oval approximately 18 inches in diameter, large enough to encircle the body, consisting of a coil of wire covered with imitation leather. The appliance is attached to the electric light circuit and made to sell for from $40.00 to $75.00. The company claims that it is of value in the treatment of many ailments. The Theronoid produces a fluctuating magnetic field which is as valuable a curative as was the Ionaco. Our readers will remember that SCIENCE AND INVENTION *Magazine stated that the Ionaco was wholly worthless, and that magnetism has no curative value whatsoever on the human organism.*

On November 19th, 1927, several months after the article on the Ionaco appeared in this publication, the Federal Trade Commission issued a formal complaint against the company which contained the following allegation: "In truth and in fact, said device when applied to the human body has no curative or therapeutic value, action or effect." The Ionaco device was also the subject of action by the Post Office Department but the action was withheld when the company agreed to cease business. Since that time many imitations of Ionaco have appeared on the market. Why action against one organization cannot be immediately applied to others of similar or identical ilk is something which we may some day be able to determine.—EDITOR.)

Far Fetched Science and the Surete

I AM sending to you an article from the Seattle Post Intelligencer, "How Science Unravels Crime Mysteries in the Foreign Detective Police Laboratories of the French Secret Police."

After looking this over I cannot see where one single bit of science shows up, the two operatives went out and got the wrong man. That I think was intended to compare with our own system. Then the scientific detective unfolded a tale that if presented by an American detective in an American Court, the detective would be turned over to a sanity commission. In the first place, granting all was so, did not the operatives let the criminal kill the woman and then get away from them in the end, when an American detective would have burst in and taken the criminal when the woman charged him with murder and they overheard it, and thus save her life also?

Would you kindly publish a comment on this article in your next issue—Could Brains Float in Jars. Living Brains with Electrical Nerves, and Talk Out of a Horn? And do you consider that the Surêté system is better than our own?

WM. SIMMONS,
Kelso, Wash.

(Far-fetched science seems to be the bone of contention of some of the feature writers for Sunday newspapers. It is absolutely ridiculous and absurd to assume that brains could be kept alive in jars and that hundreds of thousands of electrical connections could be made to the nerves and those nerves in turn be made to operate loud speakers. The nerves of man merely control the muscular structure of the vocal cords. They also control the movements of the mouth and the movements of the diaphragm, so that individual sounds, words and phrases can be produced by those muscular structures, all operating in perfect coördination or in unison. No device has ever been conceived which could even remotely produce such an effect.

No, we do not think that the Surêté system is better than the American system for the tracking down of criminals. Even the American system would be much better if all of the graft, or let us say much of it, were eliminated.—EDITOR.)

450 MILES to the GALLON!

By Alfred M. Caddell

"A PIPE DREAM!" you may say. No, a mark for American inventive genius to shoot at. Such a mileage per gallon may be impossible in any automobile known today, but there is no telling what may be accomplished when automotive engineers, metallurgical chemists, fuel and lubricating experts, road engineers and Mr. and Mrs. Driver get their heads together. The five per cent efficiency now obtained from gasoline reaches only a short distance up the ladder of possible performance.

The heat power latent in a gallon of gasoline is tremendous. T. A. Boyd, of the General Motors Corporation Research Laboratories, declares that gasoline contains far more potential energy than nitroglycerine or TNT—that the potential energy in a gallon would lift the Woolworth Building five and one-half inches above its foundation. Expressed in motor terms—the heat energy produced by burning a gallon of gasoline would perform the work done in raising a Ford touring car 10 miles vertically in the air, or in propelling it 450 miles along a level paved road at 20 miles an hour. An invisible, hair-like thread of the vaporized liquid suffices to drive a motor car. Yet this thread contains enough energy to do work equivalent to more than twenty times that obtained in the present four cycle engine, such as used on our cars and airplanes.

But the average motorist thinks in terms of 15 to 20 miles per gallon, for that is about all he gets.

How to obtain more miles per gallon of gasoline is one of the outstanding problems of motordom. Automotive engineers are trying to solve it with high-speed, high-compression engines, the increased compression of which results in greater expansion and a more powerful working stroke. Metallurgical engineers are working on alloys that will permit an even and quick absorption of superfluous heat, which must be carried away to prevent injury to the motor. Fuel technologists are striving by means of "fuel alloys" to increase gasoline efficiency. Lubrication engineers are working toward oils and greases which will reduce the percentage of power lost through friction. Road engineers are laying smoother and more durable banked-turn roads, and a good deal of valuable information about economic driving is finding its way into the minds of motorists. Soon, therefore, we may expect to see five per cent efficiency increased to eight and ten per cent—which would mean a doubling of the miles per gallon.

Prevention of Pre-Combustion or Knocking

A MAJOR obstacle to the attainment of higher mileage per gallon has been the tendency of the gas-air mixture to ignite before the peak of the combustion stroke has been reached. Pre-ignition seems essentially to depend on the fuel, but it can be aggravated by increased compression, an over-heated, carbonized motor (the red-hot carbon serving as a perpetual-firing spark-plug) or by reduced engine speed combined with an advanced spark.

Various theories have been advanced regarding the cause of pre-ignition in the fuel itself. It is known that kerosene will cause knocks resounding like an anvil chorus and that some gasolines will cause worse knocks than others, while some grades will not knock at all under a 6-to-1 compression or less. But the moment engineers attempt to increase the compression in the firing chamber—that is, to lessen the space between the piston and cylinder head—the metallic ping of pre-ignition will make itself heard.

To overcome pre-ignition and the power loss which results, fuel technologists have been alloying gasoline with petrol, alcohol, ethyl tetrachloride and various other compounds (to delay combustion until the peak (?) of the stroke has been reached).

Could we achieve even a fair increase in compression with gasoline fuels, eliminating pre-ignition, mileage per gallon would be increased 100 per cent.

(*Continued on page* 1038)

Toy Figures Come to Life *for Home Movie Makers*

By Don Bennett

In the author's first completed film of the "stop-motion" type, a tiny elephant comes to life out of shapeless clay.

The elephant venture proved so successful that Mr. Bennett repeated the process with a modeled dog's head.

Professional Movie Producers Use "Stop-Motion" and Toy Figures to Present Spectacles Otherwise Costly and Difficult to Film. Mr. Bennett Tells You Here How to Utilize This Process "on Your Own" With Satisfying Results.

LONG winter nights give the amateur movie maker an excellent opportunity to get his films in shape and make the necessary titles for them. But unedited films won't last all winter, and it's a trifle early as yet to make titles for next summer's productions. So here's a winter movie idea.

Browsing through the "five-and-ten" the other day, we were struck by the variety of small toys that are offered for sale. Soldiers, Indians, toy cars and trucks only an inch or so in length, toy houses, dolls and a hundred and one other things. Suddenly an idea smote us hard. We dug down for dimes and bought two boxes of modeling clay. Hurrying home, we got out the camera and the lights, a roll of film and a tripod. We tightened the camera on the tripod and firmly chocked the tripod legs.

Then we kneaded the modeling clay into a soft ball and started molding an elephant. (An elephant is so ungainly a beast that mistakes in modeling are hardly noticeable.)

The elephant finished, we placed him about fifteen inches from the camera, focused, and placed the lights. We forgot to mention that the camera was placed upside down on the tripod.

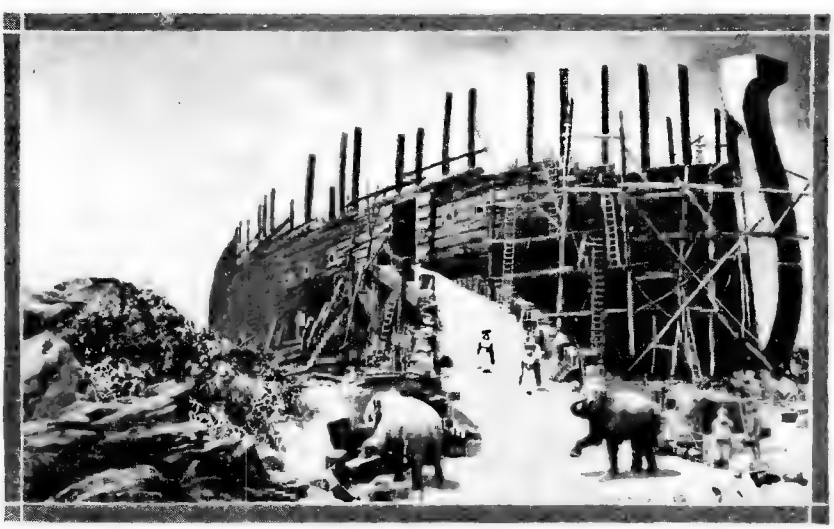
Carefully marking the place where his feet were located, we started shooting, a frame at a time. After shooting about thirty frames (single shot), we took a modeling tool made from a wooden meat skewer and started altering Jumbo's facial adornment. Pushing a little of the clay down at a time, and shooting a frame after every push, we gradually closed the tip of the trunk. After about five frames, the trunk was flat across the end. Then with a finger-tip we pressed on the end of the trunk, compressing it by degrees, shooting a frame at each change. We continued this until the trunk was just a mass of clay on the front of the head. While the trunk was getting shorter, we began to merge the ear on the camera side with the head. At length only the tip of the ear was free, and this finally was smoothed down against the head. We did the same with the tusks, rolling them up and finally smoothing them into the mass. Then, still by degrees, we reduced the head to shapelessness.

We decided at the same time to pull a trick with the tail. As we changed the head we removed this member from the body and pressed it on again a little higher up, until it reached the middle of the elephant's back. Then the body started to disintegrate. The legs gave way and became very thick and squat. The hind quarters and shoulders dropped down. All the time we kept the tail swaying back and forth. The elephant finally became just a mass of clay, with no identifying shape. The bottom of the pile started to spread out as if flowing. Finally it was a mere puddle. Last of all, the tail slipped down and merged with the rest of the clay.

We shot about twenty more frames with no movement of the clay and called it a night. The footage meter read 50, indicating about two thousand exposures. The results on the screen made our efforts doubly worth while. Since the film had been made with the camera upside down, when reversed it produces the illusion of an elephant growing out of a mass of clay.

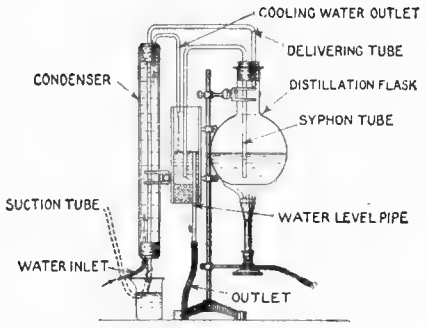
Later we tried a similar experiment with a modeled dog's head.

The same method of animation (*Continued on page* 1042)



"Stop-motion" combined with double exposure—toy figures and a life-size ark—saved the producers an enormous bill of expense in the filming of "Noah's Ark."

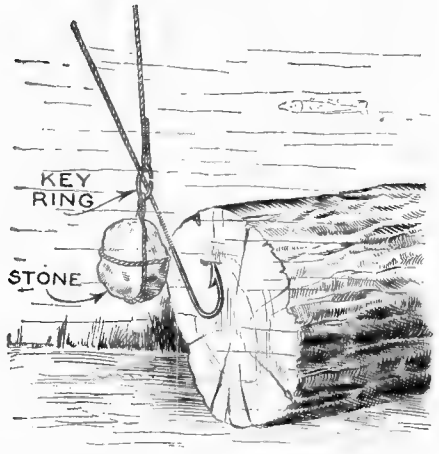
WRINKLES



Continuous Distillation

YOU laboratory experimenters can easily have distilled water all day long. Merely set up the distilling apparatus as shown in the illustration above. Start first with cool water, then insert a piece of rubber into the end of the condenser tube. Suck the air out of the apparatus until the outer air pressure compels the water to flow into the flask.—*Joseph J. Beczkoy.*

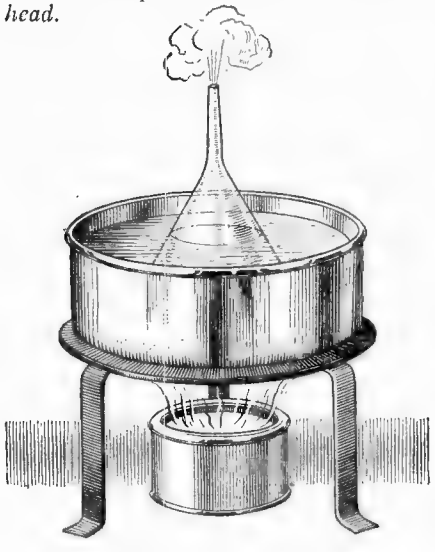
Anti-Snagging Fish Hook



IT is easy to prevent a sharp fish hook from lodging in some underwater log by attaching an iron weight to the line. This can easily be attached by splitting a key-ring and tieing the weight to the ring which is then slipped over the line—*G. M. Crane.*

Easy Way to Clean Glass Funnels

PUT water into a beaker or saucepan to a depth of about three inches. Boil but keep the flame on and place the funnel upside down—*R. C. Woodhead.*



Household Tips

WHEN putting up bathroom fixtures on a plaster wall, use a hand drill and bore a hole for the screws. If the screws are started into the plaster without first making a hole, large pieces will chip out.

When having the roof of the house reshingled, caution the workers to cover the soil pipe vent that leads to the sewer. Pieces of the shingles often drop into open pipes, causing stoppage that requires expensive repairs.

A home-made incinerator is easily made by cutting the head out of a steel barrel, and it will be a cheap and efficient incinerator. The slight draft caused by the fire causes the fire to burn slowly, thus heating the barrel to a temperature above the kindling point of paper. The papers and trash burn completely. In the fall use it to burn leaves and weeds. When it rains, turn it bottom side up, to exclude snow or water.

A rust-proof paint which will resist all atmospheric changes is composed of 5 pounds of tallow and 1 pound of turpentine melted together. Melt separately 18 oz. of sulphur, 3 1/3 oz of caustic potash, and 1 oz. of copper filings. Mix this with tallow and turpentine while hot and apply with brush just as you would paint.

To keep corners clean, also the space back of radiators, taken an old discarded broom and shape it to a point with the garden shears. Keep this handy in the kitchen for corners and for scrubbing out corners.—*Mrs. H. E. Chisman.*

Speedy Way of Removing Metal Burrs

IT is a tedious job to file or scrape the burrs from around a number of small holes in small pieces, and they must be taken off for a neat-looking job.

Emery paper, wrapped around a bolt about 4" long, with the head hacked off, can be held in a drill chuck. If the emery paper is wrapped opposite the direction of rotation with a piece of friction tape around the bottom, those burrs can be taken off without any trouble.

If a drill press isn't available, an electric drill held horizontally in a vise will do as well.—*A. O. Flinner.*

Separating Metal Parts from Dirt

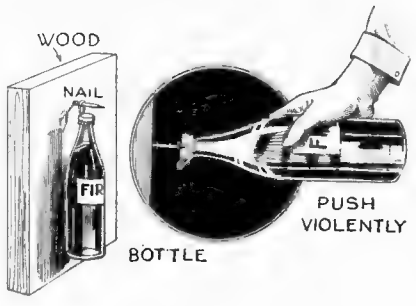
A SIMPLE way to separate dirt and dust from small metal parts, screws, nuts, etc. Pour the parts on a sheet of coarse sandpaper and shake the parts off—the dust will remain on the paper. —*William Scharpwinkel.*

For Cleaning Various Substances

Alabaster.—Use strong soap and water.

Black Silk.—Brush and wipe it thoroughly, lay on table, "display" side up; sponge with hot coffee strained through muslin; when partly dry, iron.

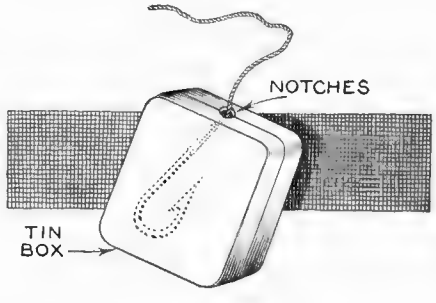
New and Simple Fire-Fighter



MOUNT a carbonated water bottle on a piece of wood. Drive a nail through the back. In case of fire, take the bottle from the nail, and hold it so the cap touches the nail. Press heavily on the bottle, and a stream will issue from it.—*Robert H. Crath.*

Prevent Fish Hooks From Dulling

AN ideal and simple way of preventing hooks from dulling is to enclose them in a tin box. Cut a slit in the box so that the hook is allowed to



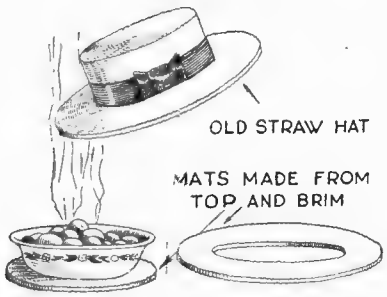
protrude as shown in the sketch. This method prevents the hook from rusting and saves the annoyance of unfastening the knotted line to the leader.—*G. M. Crane.*

Rustic Table Lamp

A NOVEL rustic lamp can easily be made from a limb of a tree. Merely cut the base to the desired size and then insert the limb through a hole in the base, first drilling or boring a hole to accommodate the wiring.—*Paul A. Gallien.*

and RECIPES

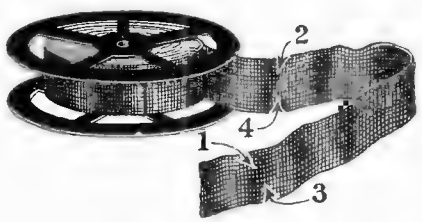
You Can Still Use the Old Straw Hat



THE brim and top from an old straw hat will make excellent mats for use in the household. The inner edges should be sown so as to prevent fraying. The appearance of these mats may be greatly enhanced by the application of a coat of lacquer or varnish.—*Dale R. Van Horn.*

Lengthening the Life of a Typewriter Ribbon

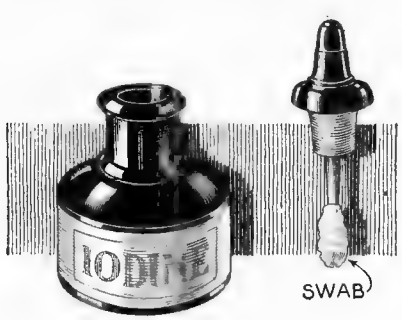
NOT only the front but the back of a typewriter ribbon may be used. I always use it like this. 1, the upper-row of the front side, 2, the upper row



of the back side, 3, lower row of the front side, 4, the lower row of the back side. In this manner the life of a typewriter ribbon is doubled.—*Kiyosi Kawahara.*

Handy Iodine Bottle

I HAVE found that an old bottle such as usually contains India drawing ink can be used for a handy container for Iodine. I merely wash the bottle in hot water and remove the label, then I remove quill used to fill drawing pens and insert a swab of cotton made from a match. The cork makes an ideal handle and does not allow the Iodine to stain the fingers, and the container renders the Iodine safer to leave around.—*Leslie F. Carpenter.*



To Remove Stains or Grease from Oil Paint.—Use bisulfid of carbon, spirits of turpentine, or if dry and old, use chloroform. These and tar spots can be softened with olive oil and lard.

Stains, Iron Rust, or Ink from Vellum or Parchment.—Moisten the spot with a solution of oxalic acid. Absorb same quickly by blotting paper or cloth.

Rust from Steel.—Take half ounce of emery powder with one ounce of soap and rub well.

Fruit Spots from Cotton.—Apply cold soap, then touch the spot with a hair pencil or feather dipped in chlorate of soda, then dip immediately in cold water.

Grease from Silks.—Take a lump of magnesia, rub it wet on the spot, let it dry, then brush the powder off.

Iron Rust may be removed from white goods by sour milk.

Scorch Stains from White Linen.—Lay in bright sun.

Mildew.—Moisten the spot with clean water; rub on it a thick coating of castile soap mixed with chalk scrapings; rub with end of finger, then wash off.

Oil Marks on Wall Paper.—Apply paste of cold water and pipe clay, leave it on all night, brush off in the morning.

Paint Spots from Clothing.—Saturate with equal parts turpentine and spirits of ammonia.

To Cleanse House Paper.—Rub with a flannel cloth dipped in oatmeal.

Black Cloth.—Mix one part of spirits of ammonia with three parts of warm water, rub with sponge or dark cloth, clean with water, rub with the nap.

Furniture, for Finger Marks.—*Rub* with a soft rag and sweet oil.

Chromos.—Go over lightly with a damp linen cloth.

Zinc.—Rub with a piece of cotton cloth dipped in kerosene, afterwards with a dry cloth.

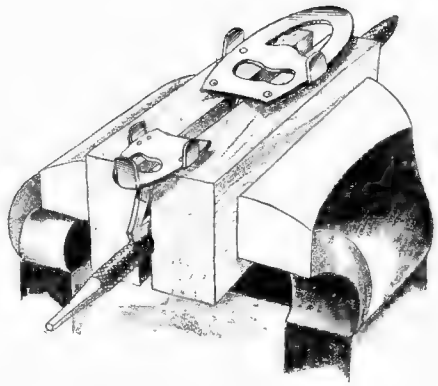
Hands from Vegetable Stains.—Rub with a slice of raw potato.

Window Glass.—Paint can be removed by a strong solution of soda.

To Clean Tinware.—Common soda applied with a moistened newspaper and polished with a dry piece, will make it look like new.

$5.00

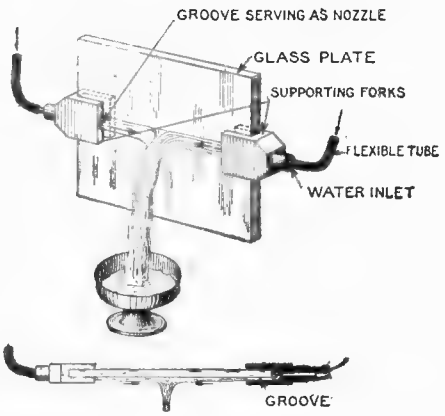
will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—*Editor Wrinkles and Recipes.*



Grind Your Own Skates

A ONE-HALF inch round file is placed in grooves in two hardwood blocks clamped in a vise as shown. To sharpen, move the runner back and forth between the blocks, pressing it against the file.—*A. C. Wilson.*

The Miraculous Spring



A PIECE of thick glass plate is provided with two supporting forks on each end. On the inner side of one leg of each fork a groove is worked out and connected with a flexible water-tube. Turn the water on, the two opposite jets of water will meet at the middle part, and a third jet seemingly coming out of the glass.—*Joseph J. Beczkoy.*

Big Corks for Little Bottles

HOW often it happens that a bottle is to be corked, and the only corks at hand are too large for its neck. The usual thing done in that case is to cut down a cork, with the result that it fits the orifice in question but very imperfectly.—*Albert Blechman.*

Let's Laugh

ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month. Jokes should be scientific. Write each joke on a separate sheet of paper and add name and address to each sheet of paper.

LABELS NEEDED

SLOANS — I feel stiff all over.

ARNICA — What's the trouble?

SLOANS — We bought futuristic furniture a couple of weeks ago, and I just found out I've been sleeping on a bookcase all the time.

—*N. Stanislo.*

MIGHT CONDENSER

HORSE SALESMAN—Yes, my lad, this is a fine steed.

RADIO SALESMAN—Yeah, I know it isn't a phoney plug, Jack, but do you think I can transform 'er so that she'll spark across the ground instead of being left at the binding post?

—*Louis Andrews.*

A MULE WOULDN'T HAVE STARTED

UNCLE TOM—Now, tell me, Johnny, how did your father die?

JOHNNY—Well, he was eating some horse meat when someone hollered "Whoa," and it stopped in his throat.

—*B. Frescki.*

FOREIGN SLANGUAGE

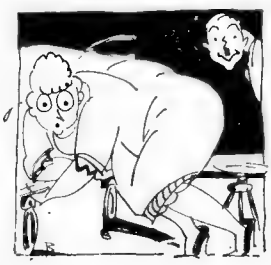
POET—Good morning to you, my dear constructor of tremendous hypotheses. Isn't this an endearing morn?

SCIENTIST—Huh—wha—? Oh, good morning to you, my dear genus biped vertebrata homo intellectus. Yes, the morning is indeed transcendental!

—*Louis Andrews.*

SHE NEVER BELIEVED HIM

First Prize $3.00



A husband, after learning that WORK is the product of a force acting and the distance through which it is exerted, arrived home and saw his wife struggling in vain to move the piano.

WIFE—John, I've worked very hard this afternoon to move the darn thing!

HUSBAND—No, no, dear, don't make me laugh; you did not perform a single foot-pound of WORK.

—*A. Pantilio.*

EVOLUTION

"Some time ago," said the pompous doctor, "when I started the practice of medicine, I was very poor. I used to sit in my office day after day, writing for patients. I sat, indeed, like Patience on a monument."

"And now," suggested the young doctor deferentially, "you have monuments on all your patients."

—*Mrs. A. C. McKinley.*

A SPEEDY INCUBATOR

Mandy was boiling an egg for her new mistress' breakfast. Her mistress was in her bedroom playing with her canary while she was awaiting the initial meal of the day. Mandy was as yet unaware of the bird's existence.

Coming back from answering the door-bell, Mandy rushed to the kitchen and encountered the bird flying about in the hall.

"Ma Lord," she shrieked, "I done boil de egg too long!"

—*Lillian E. Miller.*

CAUGHT WITH THE GOODS

A man was fishing in private waters, when a policeman crept up behind him and dropped his hand heavily on his shoulder.

"Here, you!" he snapped. "Fishing ain't allowed here."

"Ah!" replied the fisherman readily, "but I'm not fishing, constable. I am just teaching this worm to swim."

For a moment the policeman was puzzled; then suddenly his face broadened to a grin.

"Oh!" he snorted, "then you come along with me. Bathing ain't allowed in the pond without costumes, and that worm ain't got one on."

—*J. Wallis.*

GET A MAGICIAN

BOB—This vanishing cream is a fake.

LILLIE—Why, how come?

BOB—I've used it on my feet every night for the last three weeks, and they are still as large as ever.

—*Fred Berry.*

THIS IS ONE, TOO

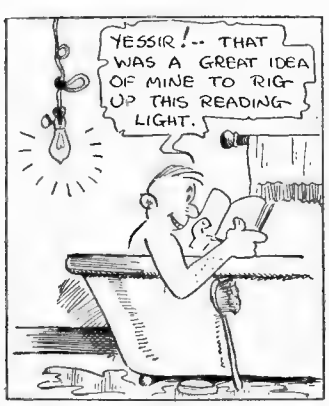
The teacher was conducting a class in English composition:

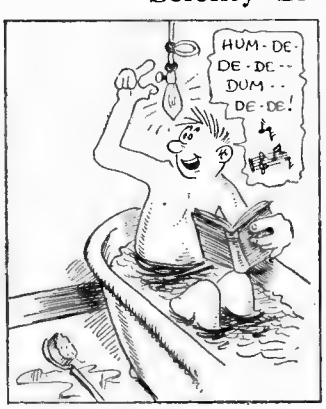
"Our next word is "anecdote." An anecdote is a short, funny tale. Now, who can give me a sentence using this word? Willie, can you?

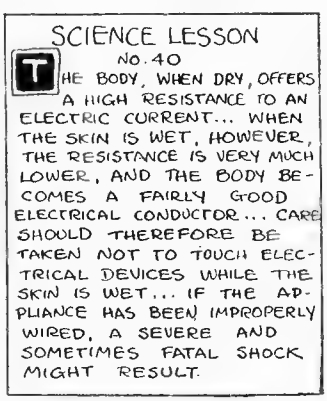
"Yes'm, teacher: A rabbit has an anecdote," said Willie.

—*Louis Andrews.*

Scienty Simon—*Scientist*



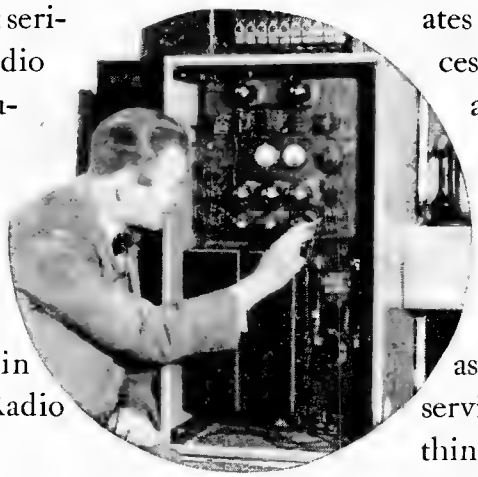



SCIENCE LESSON
NO. 40
THE BODY, WHEN DRY, OFFERS A HIGH RESISTANCE TO AN ELECTRIC CURRENT... WHEN THE SKIN IS WET, HOWEVER, THE RESISTANCE IS VERY MUCH LOWER, AND THE BODY BECOMES A FAIRLY GOOD ELECTRICAL CONDUCTOR... CARE SHOULD THEREFORE BE TAKEN NOT TO TOUCH ELECTRICAL DEVICES WHILE THE SKIN IS WET... IF THE APPLIANCE HAS BEEN IMPROPERLY WIRED, A SEVERE AND SOMETIMES FATAL SHOCK MIGHT RESULT.

RADIO NEEDS YOU

Let RCA Institutes show you the way to SUCCESS in this fast-growing industry

REACH out for a big-pay job in Radio... Tie-up to the fastest-growing industry in the world today . . . See for yourself what other men have done . . . You, too, can do the same! Hundreds of fellows just like you are now earning from $2,000 to $25,000 a year in RADIO. J. H. Barron, Radio Inspector of the U. S. Department of Commerce says that a most serious shortage in trained Radio men exists right now. Thousands of trained men are needed. Broadcasting stations, manufacturing plants, retail and wholesale dealers, as well as ships at sea and planes in the air, require trained Radio men.



Radio Mechanics earn up to $4,800 a year.

Learn Radio at Home . . . RCA Institutes Will Train You for Success!

RCA sets the standards for the entire radio industry. The RCA Institutes Home Laboratory Training Course gives you the real, inside, practical training in Radio, quicker than you could obtain it in any other way. It's easy to learn at home in your spare time. You get your lessons and criticisms direct from RCA . . . the very source of radio achievement . . . the vast world-wide organization that has made Radio what it is today . . . that sponsors every lesson in this course.

RCA Graduates Find it Easy to Fill Good Radio Jobs

There has been a radio job for practically every graduate of RCA Institutes. Graduates are actually *Trained* for Success because they learn radio by actual experience with the RCA Institutes famous outlay of apparatus given to every student of this course. You learn to solve every radio problem such as repairing, installing, and servicing fine sets. Here is everything you need know in order to fill a well-paid position in Radio.

Send for this Free Book "Radio . . . the Field of Unlimited Opportunity"

Read these 40 fascinating pages, each one packed with pictures and text that tell you everything you want to know about the many brilliant opportunities in Radio and about RCA Institutes, the world's oldest and largest radio training organization. Tune in on Radio. Send for this free book today and speed up your earning capacity!

Clip this Coupon NOW!

RCA INSTITUTES, INC.

Formerly Radio Institute of America

SPONSORED BY RCA

RCA INSTITUTES, Inc.
Dept. EX-3, 326 Broadway, New York

Gentlemen: Please send me your FREE 40-page book which illustrates the brilliant opportunities in Radio and describes your laboratory-method of instruction at home!

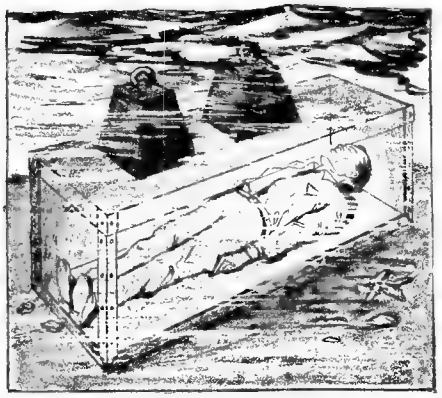
Name .....

Address .....

How Does He Live?

(2347) Elsie St. Clair, Portland, Oregon, writes:

Q. Recently, in a theatre, I saw a stage performer placed in a coffin. The coffin was sealed, completely covered with sand, and yet, after forty minutes, the man emerged from the coffin very much alive. How was the trick performed?



A person can live and breathe for two hours in a coffin this size, sealed and submerged in water.

A. There is no trickery performed; the man actually lived and breathed inside of the coffin. This same trick was performed by Houdini several years ago under somewhat different circumstances. At that time one of the members of the staff of SCIENCE AND INVENTION computed for the great master of magical mystery the length of time a man could live in a submerged coffin. It was found that Houdini could live at least two hours in this cabinet. It was found that the human body absorbs about 1½ cu. ft. of oxygen per hour, while the coffin contained about three cu. ft. of this precious gas. Houdini was sealed in a coffin which was then submerged in an indoor swimming pool. He remained under water for more than an hour and a half without feeling any bad effects from the stunt.

Pep for the Motor

(2348) F. C. Deland, Daytona Beach, Florida, writes:

Q. Will you please give me some information regarding superchargers, their merits, and whether or not they may be used on all types of motor vehicles?

A. Superchargers are now used successfully on racing cars and airplanes. They can be considered practical for private cars, motor coaches, and trucks. If superchargers are installed, considerably smaller engines can be used, as the supercharger pressure will take care of the higher velocity and distribution of mixture at the higher engine speeds when excess power is required. While testing a car equipped with a supercharger it was found to accelerate more rapidly than other cars. The supercharger increases the power output per cubic inch of piston displacement. It is estimated that with an efficient engine and supercharger, the average car ought to develop about 25 per cent. more power. Research work on a supercharged passenger car showed an increase of 18 to 20 per cent. at 3,000 revolutions per minute.

Recording at Home

(2349) L. Saunders, Dallas, Texas, writes:

Q. Can you give me some information concerning the recording of phonograph records and how this may be done with an electric pick-up?

A. Black records made especially for home recording purposes are available as

The Oracle

well as special recording needles. An ordinary phonograph electric pick-up could be used to vibrate the stylus. This unit should be energized by the power output of a high-grade transformer coupled audio amplifier or its equivalent. The input to the amplifier may be speech or music supplied through the detector tube of an ordinary radio receiver or a microphone input transformer. When using a microphone, the microphone input transformer must be used in place of the usual audio frequency transformer in most cases, as the ordinary microphone has a much lower impedance than the detector tube.

The Singing Sphinx

The singing or whistling sphinx emits a musical note by the passage of the air through the pipe in the arm of the figure.

(0000) Jack Smiley, Boston, Mass., writes:

Q. Some of my friends were recently talking about Africa—its mysteries and its many wonderful sights. One of them spoke of a "singing Sphinx" which was supposed to be located somewhere in the northern part of that continent. He said that at certain periods during the day this huge mass of inert stone and brick, built centuries ago, would emit certain musical notes. I did not take much stock in such a story, but his insistence that the tale was true prompted me to write to you for verification of the yarn.

A. The story is quite true, except for the fact that the sphinx whistles rather than sings. This masterpiece of building construction is located in the ancient and ruined city of Thebes in the northern part of Africa. The base of the sphinx is divided into two compartments both containing water. It is so built that the sun's rays strike the left compartment more than the right compartment. The heat from the sun causes an increase in pressure in the left compartment, driving the water up the siphon pipe into the right compartment. This increase of water in the right compartment causes the air to be forced out through a pipe in the arm. The exit of the air through this arm causes the musical note to be heard. When the sun goes down a reversal of the first process takes place through syphonic action.

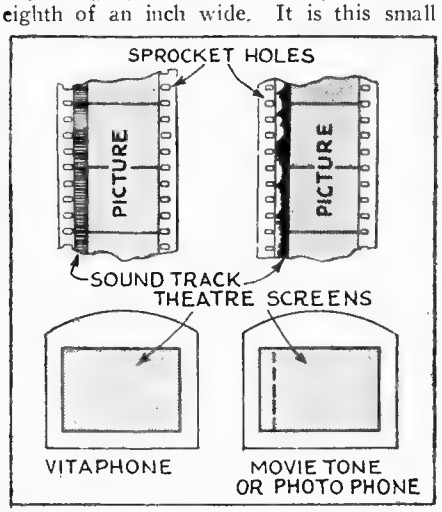
The Oracle is devoted to questions of general interest. Write legibly on one side of paper. Send diagrams or sketches on separate sheets. A nominal charge of fifty cents is requested from those who desire a quick answer by mail.

Vitaphone or Movietone?

(2351) Paul L. Welker, Brooklyn, N. Y., writes:

Q. I know very little about the actual process of making "talkies" but I am interested very much in them. I have noticed, while attending the theatre, that the screen sometimes shows a white strip on the left-hand side, whereas it was formerly completely covered by the motion picture. Could you tell me what causes the screen to appear larger?

A. There are three systems of sound recording which are consistently used. Vitaphone, Movietone, and Photophone. The last two are what is known as the "sound on film" system. That is, the sound impulses are translated into light impulses by means of a light-sensitive or photo-electric cell and recorded on the same strip of film as the actual motion picture. This sound recording is placed on the film to the left of the picture on a "sound track." This track is about an eighth of an inch wide. It is this small

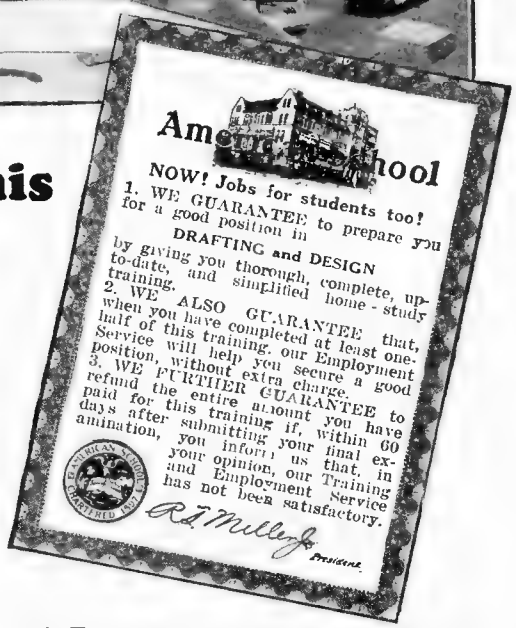


Vitaphone utilizes the full width of the movie screen, but the Movietone and Photophone leave the tell-tale white strip on the left-hand side of the screen.

space which creates the white space on the screen, for of course it is greatly enlarged when it is magnified by the projection machine. This white space is not evident when the "sound on disk" or Vitaphone system is used. In this method the sound is recorded on a disk similar to the phonograph record except that it is larger. The film, in this case is the regular 35mm. with the picture completely filling the screen.

MEN WHO WORK
with their HANDS
Make the BEST Draftsmen

We have placed machinists, carpenters, masons, plumbers, railroad men, office clerks, farmers and even laborers in fine Drafting Jobs under this plan. Mail coupon for details of our remarkable offer.


NOW! Jobs for students too!
1. WE GUARANTEE to prepare you for a good position in DRAFTING and DESIGN by giving you thorough, complete, up-to-date, and simplified home-study training.
2. WE ALSO GUARANTEE that, when you have completed at least one-half of this training, our Employment Service will help you secure a good position, without extra charge.
3. WE FURTHER GUARANTEE to refund the entire amount you have paid for this training if, within 60 days after submitting your final examination, you inform us that, in your opinion, our Training and Employment Service has not been satisfactory.
R. J. Mills, Jr.
President

—and We'll Back Them With This Employment Contract

"I have landed a job with the Pacific Tel. and Tel. Co. in Seattle, and I must say that I am greatly indebted to the American School for my success. You have done all that you promised in helping me obtain employment."
T. C. White,
Seattle, Wash.

"I have obtained a position as a junior draftsman with the Muncie Oil Engine Co., and so far I like the work real well. I appreciate your aid in obtaining this position very much."
M. N. Bareham,
Muncie, Ind.

We are looking for more ambitious young fellows with factory, building-trade or any other kind of mechanical experience to prepare for and help place in well-paid Drafting positions. Such men, we find, are unusually successful as Draftsmen, because they know how things are done, and that's a priceless asset to the man who makes the blueprint plans. Get in touch with me and I'll tell you how you can cash in on your entire past mechanical experience.

Drafting is Logically Your Next Move!

Of course you realize the biggest handicap to mechanical work is that you're limited in earning capacity to the output of your two hands, as long as you live. Even the skilled mechanic earning $50 to $60 a week has reached his limit. He can never earn more and when he gets old he will earn less. So I don't blame any man for wanting to get away from this futureless outlook. For wanting to get into something where he can use his head as well as his hands—where he will be paid for what he knows, instead of only for what he does.....You know enough about blueprints to understand that PLANS govern every move in factory and construction job. The Draftsman who makes them is several jumps ahead of the workman who follows them. And so I want you to know that DRAFTING is a logical, natural PROMOTION from mechanical and building work—better-paid, more interesting—just the kind of work you'd enjoy doing.

Get Our NO-RISK Plan

The way to a fine Drafting job for you—is easier than you think. It takes no "artistic talent" or advanced education. Thousands of men no smarter than you, with no more education or ability, have learned it quickly and you can, too. With the co-operation of some of the biggest employers and engineers in the U. S., we have worked out a plan to prepare you for Drafting work in your spare time at home—then to help you get a fine position at increased pay. Mail the coupon and we'll be glad to tell you all about this lifetime chance to get into Drafting.

THE AMERICAN SCHOOL
Dept. D-353, Drexel Ave. and 58th St., Chicago, Ill.

36-Page Drafting Book—FREE

Tells how easy Drafting is to learn—how interesting the work is—what remarkable opportunities are open for Draftsmen right now. Mail coupon for a copy—without cost or obligation.

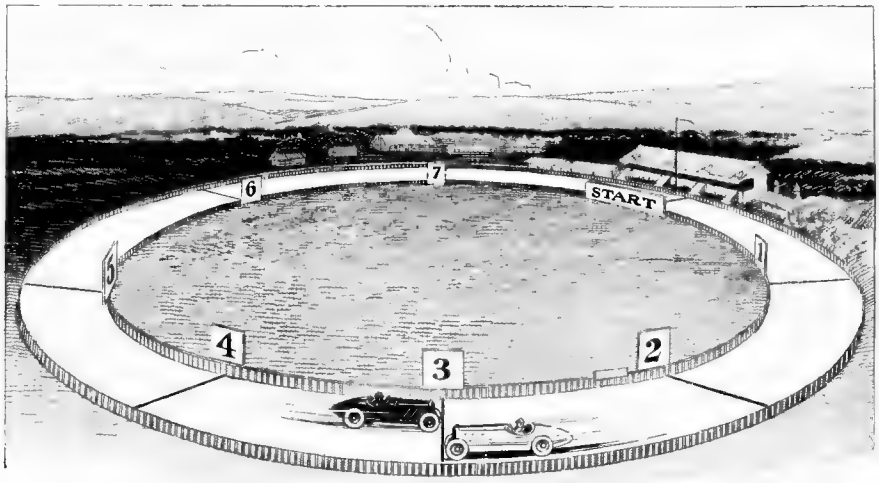
AMERICAN SCHOOL, Dept. D-353
Drexel Ave. & 58th St., Chicago, Ill.
Please tell me, without cost or obligation, about your training and employment service in line marked X below.

☐ DRAFTING
- ☐ Architecture
- ☐ Building
- ☐ Electrical Engineering
- ☐ Business Management
- ☐ Accounting
- ☐ Mechanical Engineering
- ☐ Shop Superintendent
- ☐ Foremanship
- ☐ High School in 2 years
- ☐ Structural Steel
- ☐ Civil Engineering
- ☐ Auto Engineering

Name .....
St. No. .....
City ..... State .....
Age ..... Occupation .....

Solve *these* Brain Teasers *and* Win *a* Prize

By Sam Loyd



A Puzzling Race

HERE is a problem in circumstantial evidence, the solving of which calls for close inspection and careful deduction of the data.

The sketch presents the salient features of a snapshot taken before the winning car in an automobile race had gone a third of its set journey.

The cars left the starting line simultaneously, and raced in opposite directions around the eight-furlong track, maintaining their respective top speeds throughout the race.

The race was for eight miles, and it was noted that after leaving the starting line, the cars subsequently met and passed each other thirteen times during the time of the contest.

From the pictured and recited facts, we are expected to prove which car, white or black, won the race, and by what distance.

Look at it again and see if you can solve it. It may look easy at first, but after studying it for a while, you will realize that it is one of the best brain teasers of the Puzzle King.

Twenty-five Dollars in Prizes

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the two puzzles *accompanied by the best expressed analysis of the Puzzling Race.*

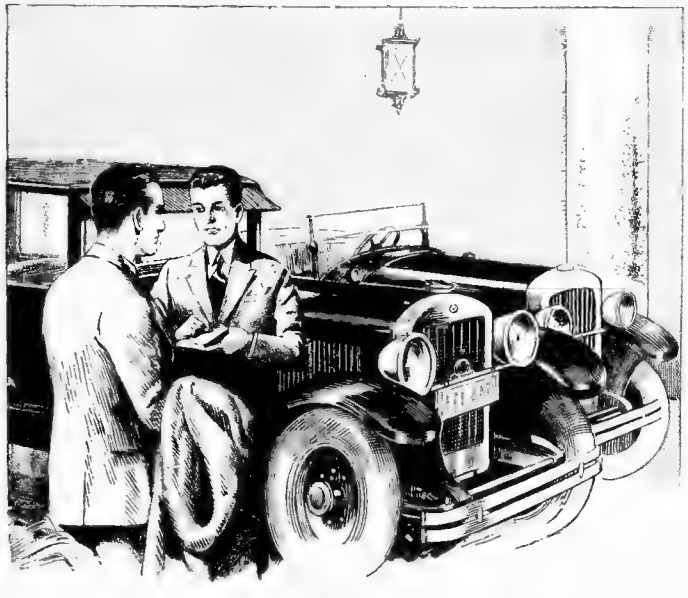
A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analyses of the Puzzling Race, together with correct answers to the two puzzles.

Answers must be received not later than noon, March 15th, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 381 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.



The Used-Car Problem

AN automobile dealer allowed a customer $1,235, for his two traded-in cars.

Then the dealer sold one of the has-beens for ten per cent below the traded-in price, and the other for ten per cent above the amount he had allowed for it.

"Not so bad," said the dealer, "for in addition to my profit on the new car, five per cent of the cash I received for the two old busses was profit."

What trade-in allowance did the dealer make on each of the old cars?

If every used car salesman could arrange his sales after the manner of Sam Loyd, he would either soon be out of business or retiring on his huge profits. If you can solve this logical successor to the other two brain puzzlers published in previous issues of SCIENCE & INVENTION, you will prove yourself to be a real dyed-in-the-wool puzzle fan. We think you will find it more difficult than the palindrome published in the January issue or the Jack London puzzle published in February. And by the way, the winners of the January puzzle will be published in the April issue, the winners of the February prize in the May issue, and the successful solver of this brain teaser, in the June issue.

Seven Famous Americans Send You an Important Message

DR. HENRY SMITH WILLIAMS: *Editor Historian's History of the World* (25 vols.), author *"The Story of Modern Science,"* etc., and one of America's foremost men of letters, says:

"I am writing to tell you how much I enjoyed your book on Voltaire. There have been many lives on Voltaire, but, your nutshell presentation can take the place of most of them. I wish it might be in 25,000,000 homes as a liberalizing document."

DR. WOODBRIDGE RILEY, *Professor of Philosophy—Vassar College,* author *"Men and Morals,"* etc.

"Just as soon as I received *Voltaire, The Incomparable Infidel,* I sat down and read it and did not stop reading until I had finished. Joseph Lewis has given the very spirit of this great thinker's mind in a most remarkable manner."

DR. E. BOYD BARRETT, author *"The Jesuit Enigma,"* etc.

"*Voltaire, The Incomparable Infidel,* is exceedingly interesting and stimulating reading. I enjoyed this book immensely."

WM. J. FIELDING, author *"The Caveman Within Us,"* etc.

"*Voltaire* is certainly packed with illuminating material concerning the life and activities of the great Frenchman. It will do much to make the specific work of Voltaire more widely appreciated."

PROF. JOSEPH JASTROW, *Foremost American Psychologist.*

"Your presentation will certainly be of value in permitting the reader to get an idea of the personality and influence of Voltaire."

FULTON OURSLER, coauthor *"The Spider."*

"I enjoyed Joseph Lewis's hymn to Voltaire. He packs a great deal of information into a small compass. He has made a miniature full of stimulating and dramatic power."

HERBERT ASBURY, author *"Up From Methodism,"* etc.

"I haven't read a book in years that interested me so much as *Voltaire, the Incomparable Infidel.* Mr. Lewis, I think, has done full justice to the man whose life is an inspiration to all who fight for freedom from religious persecution."

Why do these seven great men urge you to read Joseph Lewis's startling book about Voltaire? You know these men—authors, educators, scientists. You respect their opinions and ideas. Read their enthusiastic comments which tell you, better than anything we might say, what this book has in store for you. Joseph Lewis's fascinating book is written with a sparkle and snap that makes reading it one long thrill. From the first page it grips your attention, and holds you spellbound to the last line. Read this amazing book if you want intelligent pleasure, crammed full and running over with facts that astound and delight.

JOSEPH LEWIS

This Thrilling Book—*only* $1

Joseph Lewis tells you why Voltaire is famous as the world's most heroic champion of human freedom. Perhaps you know Voltaire best as an author of keen-witted stories, and mirth-provoking comedies. But Mr. Lewis, in his fascinating book, takes you back of the scenes and shows you the purpose Voltaire had in all his writings. You learn, perhaps for the first time, that more than any other man before or since, Voltaire has helped to free the world from mental slavery and degradation. Alone, he dared to fight the double tyranny of king and priest. In an age of bigotry, while screaming victims still were being burned at the fires of the inquisition, Voltaire defended the victims regardless of their beliefs. For nearly seventy years he fought for human rights. And when he died, he saw a world that looked up to him with thanks.

That is the dramatic, masterful story that Joseph Lewis portrays in his new book. That is why Seven Great Americans—eminent in their particular field of thought—hail *Voltaire, the Incomparable Infidel.*

Send for this amazing book. It is printed on special antique paper, beautifully bound in royal purple cloth, with gold-stamped title and contains two full-page photographs. Get the book now at the low introductory price of only $1.00 plus 15c postage. Mail the coupon for YOUR copy at once, and let it inspire your heart, stimulate your mind, and set your nerves atingle with thrilling surprises.

If you are not agreeably surprised beyond all expectations, you may return the book and we will refund your money.

The Freethought Press Association
250 West 54th Street, New York **Dept. V. 4**

What the American Hebrew says of
"Voltaire, the Incomparable Infidel"

It is a source of sincere regret that the author confined this fascinating work to a mere one hundred pages. It is surely deserving of at least five hundred.

He presents an unforgettable picture of conditions prevailing in the Church in France in the 17th and 18th centuries; conditions of intolerance, ecclesiastical bigotry, persecution, gross superstitions, ignorance, and murder in the name of the Church, which called forth Voltaire's activities, satires, and attacks. . . . The author spikes as cleverly as did Mark Twain in his "Connecticut Yankee" many of the ignorant acts, superstitions, persecutions, and intolerable bigotry of the Church of the 18th Century.

The sketch of Voltaire's teachings is succinct and inspiring. . . . The chapter in which the author portrays Voltaire's denunciation of all war waged for religious or national purposes is a classic. . . . Regarding Mozart's gross and bigoted remark about Voltaire's death, the author states: "A man may be a great musician and still be a bigot and utterly ignorant of the very fundamentals of human freedom." The description of Voltaire's death-bed scene is unusually effective.

The Freethought Press Assn., Dept. V4
250 West 54th Street, New York, N. Y.

I enclose remittance for $1.15. Please send me by return mail prepaid, one copy of Joseph Lewis's thrilling book, "VOLTAIRE, The Incomparable Infidel"—printed in Caslon type, containing 100 pages printed on extra quality book paper and bound in royal purple cloth, with the title stamped in gold.

Name .....

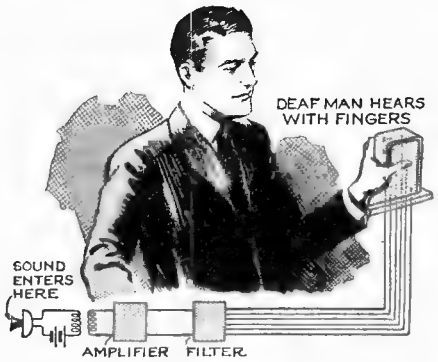
Address .....

City ..... State.....

☐ A special Souvenir edition of only 250 copies of "VOLTAIRE, The Incomparable Infidel," has been printed on special water-marked Utopian paper, with silk marker, gilt-top pages and bound in genuine Morocco, with the title stamped in gold. Each copy is numbered and signed by the author. The price of this special edition is only $2.50. If wanted, put an X in square.

☐ A special combination offer of Mr. Lewis's brochures "Lincoln, the Freethinker," "Franklin, the Freethinker," "Jefferson, the Freethinker," together with a copy of Mr. Lewis's eloquent radio addresses on "Lincoln, the Soldier," and "Gems from Ingersoll," will be sent for only 50c additional. If wanted, put an X in square and add 50c to your remittance.

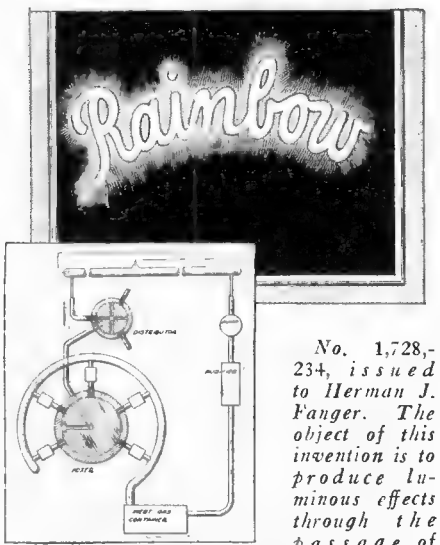
Yankee Brains *at* Work



Sound That Can Be Felt

No. 1,733,605, issued to Warren C. Jones. This invention relates to the tactual interpretation of sound vibrations. Its object is to enable a totally deaf person to interpret sound. It comprises a system for breaking up the speech spectrum into a number of distinct bands, bearing an octave relation to one another. A number of vibratal members on a sounding board transfer electrical vibrations to the fingers.

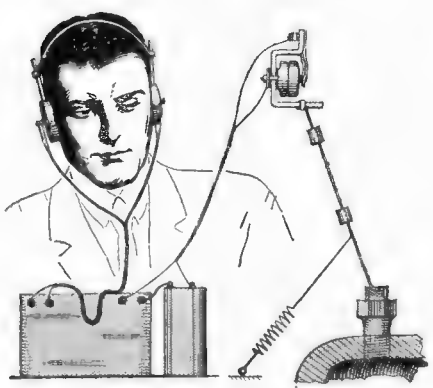
Rainbow Lights



No. 1,728,234, issued to Herman J. Fanger. The object of this invention is to produce luminous effects through the passage of electrical currents of high potential through a tube containing an inert gas. It comprises a rotary member for mixing inert gases so that a multicolored lighting effect is produced.

Knock Detector for Gas Engines

No. 1,725,872, issued to Rolland J. Lawrence. The object of this invention is to procure an audible means for determining the characteristics of a carbon knock in an internal combustion engine. The apparatus consists of an electrical oscillating circuit, a taut cable and a head-piece to be connected to the cable.



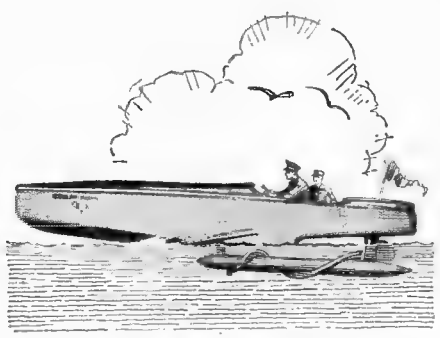
Notice to Readers:

AN appreciable period of time elapses between the filing of a patent and the date upon which the patent is granted. During this interval inventors frequently move. We regret that it is quite impossible for us to supply the correct addresses of persons whose inventions appear on this page, nor can we furnish information about when the product may appear on the market. Attorneys who prosecuted the patent cases can furnish the most reliable data. Copies of patents are available at ten cents each from the U. S. Patent Office, Washington, D. C.

Combination Cigarette Lighter and Electric Light

No. 1,728,049, issued to Albert W. Franklin. The principle of this invention is to provide a cigar or cigarette lighter energized by electricity, and so arranged that the lighter may be controlled independently of the light source. The invention comprises a plug-and-socket electrical light fixture, a three-wire cable connected to the fixture, a cigarette lighter connected to the cable and a switch for controlling the socket.

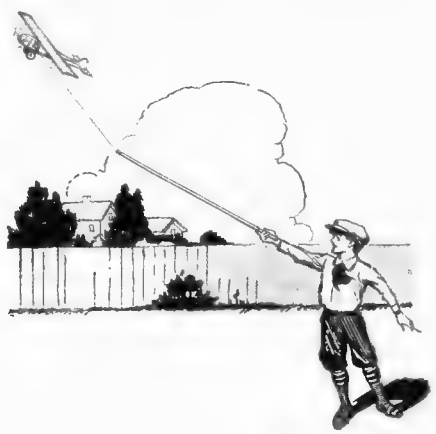
New Speed Boat Propeller



No. 1,731,493, issued to Rex Harris. The object of this invention is to provide a long helical propeller which will tend to raise the hull of the boat sufficiently so as to decrease materially water friction and resistance. It consists of a hull, a pair of long longitudinally extending helical propellers, struts extending downward from the hull to support the propellers, and a rudder post extending downwardly from the hull and joining the longitudinal struts.

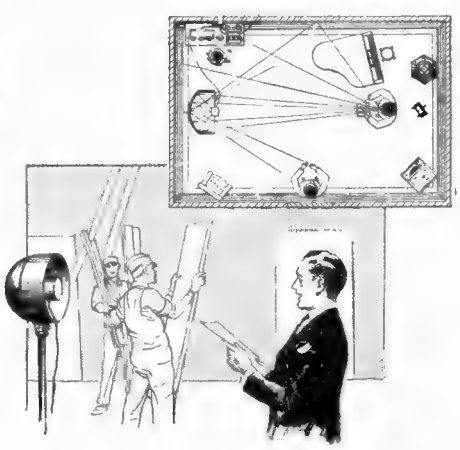
Toy Airplane

No. 1,728,245, issued to Benjamin C. Merritt. The purpose of this invention is to provide a toy in the form of an airplane which can be whirled around in the air in a circle and will fly in such a way as to simulate the flight of an airplane. It consists of three cords connected to the body and wing of the plane and meeting at a point away from the plane where they are connected to a rod by which the toy can be manipulated.



Directional Microphone

No. 1,732,722, issued to Charles W. Horn. The object is to provide a microphone which will respond and pick up the desired sounds, rejecting extraneous noises. It consists of a parabolic sound reflector, a sound responsive element mounted at the focus, a cylindrical shield surrounding the microphone and a felt covering on the exterior of the reflector and shield.



HOW TO MAKE YOUR FUTURE!

W. C. Durant

It has fallen to the lot of W. C. Durant to be a leader among men and affairs. His thoughts and ideas, his philosophy and beliefs, have built towering structures and industries. He has lived and kept pace with progress. And, he has succeeded because he knew how. He tells the way to make your fortune in the March issue.

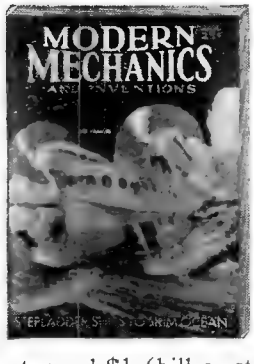
It does not require the wealth of millions in order to make one's fortune. As W. C. Durant points out in this article, it requires a well-directed course, the gumption to get ahead and the ability to think. Read "Fortunes in the Making" and plan your future success under the guidance of W. C. Durant.

Now on Sale at All Newsstands—25c

In March

MODERN MECHANICS

In March *Modern Mechanics,* too, will be found an opportunity for you to win your wings. Every month *Modern Mechanics* presents free a ten-hour course of dual and solo flight instruction under competent and licensed pilots. Get your copy of March *Modern Mechanics*—on sale everywhere—and read the easy way in which you can earn an opportunity to fly. Win your wings!



Here are other features that can be found in March *Modern Mechanics:*

Cord's Own Story on the Front Wheel Drive
The Mechanics of Hockey
The Latest in Aeronautics
How to Make Handy Home Necessities
Tricks and How to Perform Them
And 1001 Short, Helpful Items of Interest
How to Build a Parasol Baby Seaplane

Get your copy now! If your favorite newsstand is sold out, send $1 (bill or stamps) and *Modern Mechanics and Inventions* will be sent you each month for the next five months. Address: *Modern Mechanics and Inventions,* Fawcett Publications, 501 7th Ave. So., Minneapolis, Minn.

INVENTORS

Protect Your Ideas

Send for our Guide Book, HOW TO GET YOUR PATENT, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention for INSPECTION and INSTRUCTIONS FREE. TERMS REASONABLE. BEST REFERENCES.

RANDOLPH & CO.

PATENT ATTORNEYS

Dept. 172, Washington, D. C.

Name.....

Street.....

City.....

PATENTS

TRADE-MARKS

DO NOT LOSE YOUR RIGHTS TO PATENT PROTECTION

Before disclosing your invention to anyone send for blank from "EVIDENCE OF CONCEPTION" to be signed and witnessed.

LANCASTER, ALLWINE & ROMMEL
Registered Attorneys
255 OURAY BLDG. WASHINGTON, D. C.
Originators of forms
"Evidence of Conception"

INVENTORS MODELS

Mechanical Specialists for over 20 years. Rendering Complete Service to the man with an Idea

Labor-Saving Machinery Designed & Built

Circular - References - Guarantee - Free
BERNARD & HELLER - 31 East 17th St. N.Y.C.

Have You An Idea?
Would You Like To Get It Patented?
—Is the Delay Due To LACK of FUNDS?
If so, we can help you

WRITE us immediately for free information regarding our time payment plan for the benefit of inventors which should enable you to proceed without further delay.

——MAIL THIS COUPON NOW——
INVENTORS FINANCE CORPORATION
Dept. C, Union Trust Bldg., Washington, D. C.
Please send me particulars with reference to above plan, and information about the way to proceed.

Name .....
Address .....
City ..... State .....

PATENT ADVICE

CONDUCTED BY JOSEPH H. KRAUS

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail, a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

Coding System

(1206) Anthony Joss, Auckland, N. Z., has designed a system of code work which he claims to be practically indecipherable. He sends several samples of code messages.

A. 1. There are many ways in which a code system can be developed that will be practically indecipherable and wherein the code might be changed at a moment's notice.

The slide rule principle is but one of these systems. The letters A B C D are set up on one scale and other letters or combinations thereof are set up on the other scale. Shifting the rule permits of a complete change.

The circular slide rule is even better, wherein there are two discs concentrically arranged and the letters appear in any order on one of the discs, but follow a sequence on the other. Shifting the rule changes the entire code. In modern systems it is not necessary to code letters. Everything is taken care of by automatic typewriters which code as they write and decode as they rewrite. A simple camlike device permits of this coding and decoding. These cams could be changed as often as the person using the machine thinks it advisable.

We do not believe that you can finance a code proposition of any type and make money therefrom. There are few commercial uses for such an article, and we consequently advise no action.

Perpetual Calendar

(1207) Edward Fegan, Cincinnati, Ohio, asks:—

What do you think of an idea of a perpetual calender to be attached to a pen or a pencil.

A.—About four or five years ago an organization placed an article of this nature on the American market. While it is true that there was no magnifying glass which accompanied the product so that you could read the dates more easily, the figures were quite legible and no great difficulty was entertained in reading the material under the celluloid protective piece. While such an idea seems to be quite favorable from a novel aspect, for some reason or other it does not meet with a very ready market. It generally makes the pen more bulky, and usually necessitates resetting either daily or monthly. Some day a manufacturer will develop a really practical perpetual calender that can be applied to a fountain pen or that can be used for office purposes. We have seen many that come quite close to hitting the mark. We do not believe that your suggestion falls into this classification at all, and would advise no action.

Three Ideas—One Good

(1208) George Walter Barrush, Pittsburgh, Pa., writes:—

What do you think of an apparatus that will transmit recorded sound a fraction of a second after it is picked up by the reproducer. This for the purpose of giving the effect of depth in reproduction.

2.—A cordless electric iron, the nature of which the editor of this department does not disclose at the present time.

3.—A window shade roller to which the window shade can quickly be attached without the use of tacks and from which the shade can be as easily removed.

A 1.—This idea is very old. By employing the telegraphone principle a vast change of time as possible between the moment that the sound is picked up, to which it is transmitted to the audience. The longer the distance between the recording magnet and the reproducing magnet and the slower the tape moves the longer is the time interval.

A 2.—We think that the idea of the cordless electric iron is very good. The only difficulty with a project of this nature is that it will probably cost too much to operate. Nevertheless, it might be worth your while to experiment with this suggestion. It opens up several new applications of a known principle which might be applied to other articles. The idea exists in a different form today but it has never been applied to household utility devices. If you can cut down the cost of manufacture and the cost in using the appliance we believe a good market can be secured.

A 3.—The window shade roller idea is very old.

Hinge for Swinging Door

(1209) Howard Woods, St. James, Manitoba, Canada, has developed a new type of hinge for doors which permits the door to swing from either side.

A.—It would be quite difficult to market your hinged door unless you supplied the door complete, together with the hinges. The nature of the construction you employ makes this necessary. Then again there are very few places where the door need swing from either side of the door-jamb. This further limits the market. However there is one distinct advantage in your system and that is that it will permit of instant removal of the door from its hinges. The question is where can such a thing be used and where would it pay.

While we consider the system unique and we also consider the device patentable, we would not suggest applying for a patent on the same unless you are willing to take the gambler's chance, namely—that sometime a use for this door will be discovered which will more than pay for the cost.

PATENTS

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ.

My Patent Law Offices Just Across Street From U.S. Pat. Office

All drawings and specifications are prepared under my personal supervision.

Protect Your Ideas

Take the First Step Today—Action Counts

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon below.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

Strict Secrecy Preserved—Write Me in Confidence

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.

No Charge for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will send you my "Record of Invention" form, on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

Clarence A. O'Brien

Registered Patent Attorney
Attorney-at-Law

Member of Bar of: Supreme Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims.

PRACTICE CONFINED EXCLUSIVELY TO PATENTS, TRADEMARKS AND COPYRIGHTS

Inventors *Write for these* Free Books

Mail this Coupon *Now*

CLARENCE A. O'BRIEN
Registered Patent Attorney and Attorney-at-Law
532 Security Savings & Commercial Bank Bldg.
WASHINGTON, D. C.
—or—
Suite 1106, Woolworth Bldg.
NEW YORK CITY

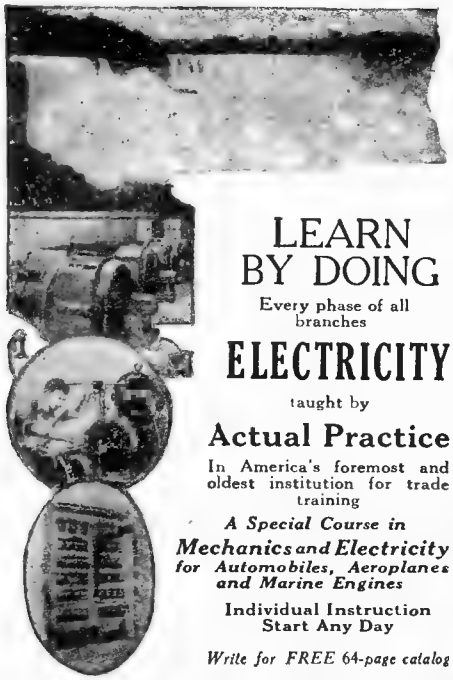
Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name .....

Address .....

.....

(Important! Write plainly and address office nearest you)



LEARN BY DOING

Every phase of all branches

ELECTRICITY

taught by

Actual Practice

In America's foremost and oldest institution for trade training

A Special Course in

Mechanics and Electricity for Automobiles, Aeroplanes and Marine Engines

Individual Instruction Start Any Day

Write for FREE 64-page catalog

THE NEW YORK ELECTRICAL SCHOOL

29 West 17th Street New York City

PATENTS

WRITE FOR FREE INSTRUCTIONS
Send drawing or model for examination.
CARL MILLER, Patent Attorney
Former member Examining Corps, U. S. Patent Office
261 McGill Building, Washington, D. C.

PATENT YOUR INVENTIONS
EDWARD GOTTLIEB
Attorney in Patent Causes
5 Beekman Street
New York
Inventions Developed—Representative for Blair Tool and Machine Corp.

INVENTORS

We have been in business 30 years. If your invention or patent has merit, send details or model, or write for information. Complete facilities. References. Adam Fisher Mfg. Co., 205-D Enright, St. Louis, Mo.

INVENTORS who derive largest profits know and heed certain simple but vital facts before applying for patents. Our book, Patent-Sense, gives these facts; sent free. Write

LACEY & LACEY
644 F STREET WASHINGTON, D. C.
Established 1869

NEW YEAR - NEW IDEA
PATENT YOUR IDEAS
Call or send me a sketch of your invention. Phone LONgacre 308
FREE Inventors Recording Blank Confidential Advice
U. S. and Foreign Patents secured by
Z.H.POLACHEK Reg. Patent Attorney Consult. Engineer
1234 Broadway, New York

QUALITY TOOL CHESTS
The finest in America for Machinists and Tool Makers. Many sizes and styles in free catalog.
H. GERSTNER & SONS
675 Columbia Street
Dayton, Ohio

Do You Know Your Cars?

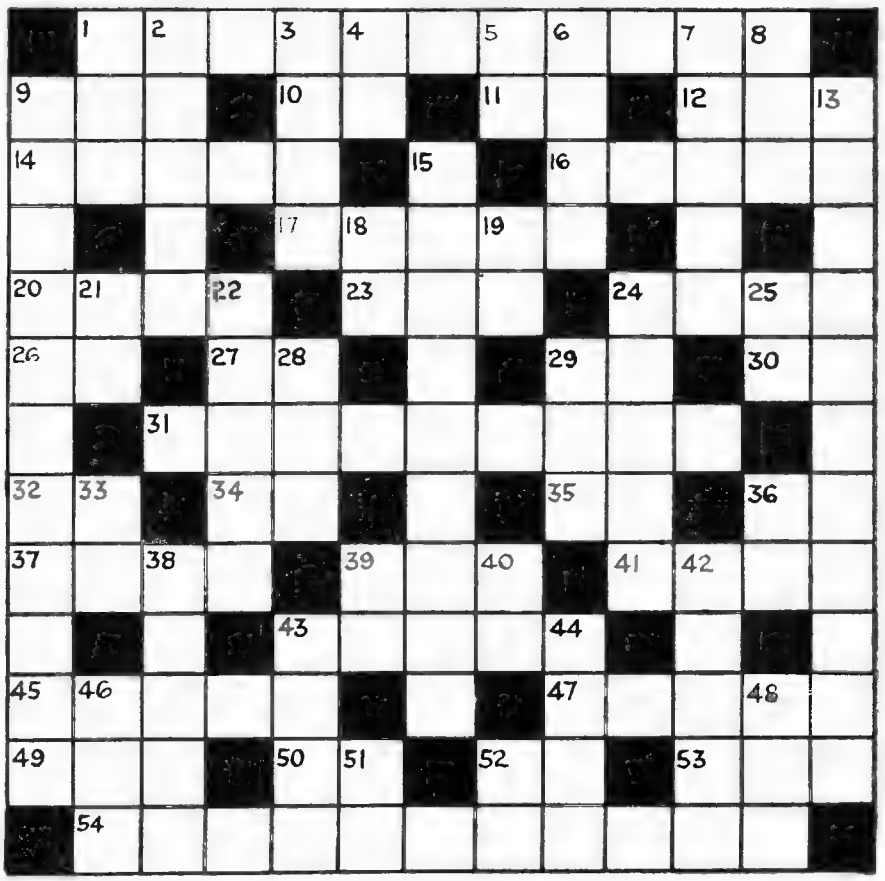
A Cross-word Puzzle by RICHARD H. TINGLEY, C.E.

ACROSS

1. A very popular tire because of its shock-absorbing qualities.
9. Abbreviation for a figure of six sides. Many of the nuts used in motor car construction are six-sided, and the abbreviated form of the word is the trade name for them.
10. An indefinite article meaning "one" or "any."
11. Chemical symbol for a metal worth $20.67 an ounce—too expensive for automobile work. (Write all letters capitals.)
12. A part of a circle; a principle in construction well known to motor-car engineers.
14. There appears to be more of this kind of irresponsibles driving cars about the streets than there should be.
16. An afterthought sentence added or attached to the contract signed by both parties when you purchase a car on the installment plan.
17. A certain variety of automobile horn.
20. One of the "eyes" of an automobile.
23. Sometimes encountered in bad roads; often difficult to get out of if too deep.
24. The wherewithal one gives up at the service station when one stops for "gas."
26. One more than a century run of your car.
27. The standard dictionary abbreviation for "each."
29. Universal lubricant; an abbreviation.
30. One of the best-known abbreviations in our vernacular. It means that everything is "all right."
31. That part of a motor car which connects the driving shaft with the motor.
32. A neuter pronoun; a thing.
34. Abbreviation for the name of the river under which the Holland Tunnel takes your car from New York City over to New Jersey.
35. That part of the day before twelve o'clock, noon.
36. Chemical symbol for rhodium; a metal of the platinum group. (On the solution diagram the small letter of the symbol is written as a capital.)
37. A word meaning "a large number," or "numerous." It might well be applied to the number of automobiles one sees in evidence everywhere.
39. A walled-in excavation useful in repair shops and garages where a man can get under his car and work without lying flat on his back.
41. A river and city in Brazil whence comes the best rubber that goes into the construction of your tires.
43. There are two of these to every car. One is connected with the drive by a differential. Not so with the other.
45. The only known way of getting into a car.
47. An Irish patriot of other days. Many a good son of Erin is named after him.
49. Rear axle rod or rods; a standard trade abbreviation.
50. A scholastic degree conferred by colleges.
52. One of the notes of the musical scale which your "siren" sometimes hits.
53. The plural of the thirteenth letter of the alphabet.
54. Any automobilist will know that these are a part of the ignition system.

DOWN

1. A place welcome at night to a driver who has been at the wheel all day.
2. A self-evident truth—namely, that the saturation point in motor car production has not yet been reached.
3. The inhabitants of one of the new Central European countries created by the Treaty of Versailles. This country boasts of 2,224 motor cars at last accounts.
4. An adverb denoting position. Also a preposition denoting lying on the top.
5. One of the American continents which registers 25,630,000 motor cars, all told; an abbreviation.
6. The highways are full of these and some are very sharp. It is well to "go slow" when approaching them.
7. Wireless. A few automobiles are said to be equipped with it.
8. A somewhat poetic way of saying "before."
9. A most valuable quality in a car; all dealers claim theirs is particularly good at it.
13. That part of the motor to which the connecting rods are attached; plural.
15. The raw materials from which the "gas" is refined.
18. The chemical symbol for Iridium; a metal worth many times the value of gold. (Write all capitals.)
19. In Latin or French this word means "and."
21. A well-known symbol meaning that everything is "first-class."
22. A little coin with which you can't buy much of anything.
24. A device for holding parts together; a valuable adjunct to a garage or machine shop.
25. The number of the digits, provided you count zero as one of them.
28. A necessary element; free at all service stations.



(*Continued on page* 1033)

29. The country in which we live. Twenty-four and a half million of the world's thirty-two million motor cars are registered here.
33. Chemical symbol for tantalum; a rare metal. (Write all capitals.)
36. An abbreviation for our standard means of transportation. The automotive industry has played havoc with its previously well-established methods of doing business.
38. A prefix meaning "nitrogen." One of the elements in the "air" that is pumped into our tires.
39. The standard dictionary abbreviation for "please exchange."
40. Chemical symbol for "tellurium," a rare metal. (Write all capitals.)
42. One who takes aim.
43. An ancient Asian country west of Babylonia. It is now a part of Syria. Its people knew not the motor car.
44. A necessary adjunct to an automobile if one would be comfortable. Some cars have two; some seven or more.
46. National Automobile Congress; an abbreviation.
48. Devices used by printers in measuring the space occupied by the type when setting up copy of automobile catalogs.
51. A venerable seat of learning situated at Providence, R. I.; abbreviation.
52. Abbreviation for a Southern state, of which Baton Rouge is the capital. It has a registration of 264,000 motor cars. (Write as capitals.)

(Solution on page 1049)

Shall We Fly by Rocket?

By Prof. Robert H. Goddard

(*Continued from page* 983)

might successfully be fired to the moon? My answer is that it can be accomplished in the present generation, because the short flights I have obtained in Auburn, Massachusetts, with liquid propellants have shown how such rockets can be constructed to operate successfully. Liquid hydrogen and oxygen, which would be necessary as propellants, must be used in the same way I have used liquids in these tests. I doubt, however, if a rocket will be sent to the moon for many years, simply for the reason that the public will remain unconvinced as to the possibilities of the rocket method until a very great height has actually been attained by a small rocket. Furthermore, conjecture concerning reaching the moon, while keenly interesting, remains, after all, merely conjecture; there is much to be done, and much to be learned from the flights of smaller rockets concerning air-density, pressure, temperature.

Also, the adaptation of rockets to more familiar means of transportation opens up a tremendous field for research. While my chief interest always has been, and continues to be, the attainment of great altitudes for purely scientific purposes, I realize that rocket planes having speeds many times greater than the present record speed for airplanes are possible, but I do not look for such developments within the next five or ten years, even though the principles that must be used have been shown to operate experimentally in the liquid-propellant rockets I have already mentioned. This is a matter which will probably not be considered a live issue until very high and rapid flights have been obtained by small liquid-propellant rockets.

As for transoceanic airplanes traveling at high speeds in the thin air at great elevations, I believe this will be done in the future. The ordinary airplane cannot, however, take advantage of this mode of ocean crossing to the same extent as the rocket plane, for the ordinary airplane engine is ill adapted to operate in thin air, whereas the rocket operates just as easily and with much increased efficiency.

PATENTS TRADE-MARKS AND COPYRIGHTS

VICTOR BUILDING
Our New Building Nearly Opposite U. S. Patent Office Specially Erected by Us for Our Own Use

OUR OFFER: FOR THE PRODUCTION OF YOUR INVENTION

YOUR FIRST STEP—The inventor should write for our blank form, "RECORD OF INVENTION." Before disclosing your invention, a sketch and description should be made on our "Record of Invention Blank", signed, witnessed, then returned to us and we will place it in our fireproof secret files. **We will also give our opinion** as to whether the invention comes within the Patent Office definition of a patentable invention. This "Record of Invention" will serve as "proof of conception" until the case can be filed in the Patent Office. ***There is no charge or obligation for this service.***

Write for Our Five Books Mailed Free to Inventors

Our Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents, Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE-MARK BOOK

Shows value and necessity of Trade-Mark Protection. Information regarding TRADE-MARKS AND UNFAIR COMPETITION IN TRADE.

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost.

PROGRESS OF INVENTION

Description of World's Most Pressing Problems by Leading Scientists and INVENTORS.

DELAYS ARE DANGEROUS IN PATENT MATTERS

TO AVOID DELAY: YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to save correspondence, secure protection and early filing date in Patent Office. You should send us a model, sketch or photograph with a description of your invention together with $25.00 on account. We will make an examination of the U. S. Patent Office records and if it is Patentable we will prepare the official drawings immediately and forward them for approval. If the invention is not patentable we will return the fee less the cost of the examination.

PAYMENT OF FEES IN INSTALLMENTS

It is not necessary that the total cost of a patent be paid in one payment. We permit our clients to pay for their applications in three installments as the preparation of the application progresses in our office.

ALL COMMUNICATIONS AND DATA STRICTLY SECRET AND CONFIDENTIAL. INTERFERENCE AND INFRINGEMENT SUITS PROSECUTED. Our Large, Comprehensive Organization has been established for 30 years and offers Prompt, Efficient and **Personal Service** by experienced Patent Lawyers and Draftsmen. We shall be glad to have you consult us or to answer any questions in regard to Patents, Trademarks or Copyrights without charge.

Highest References—Prompt Service—Reasonable Terms

WRITE TODAY

FREE COUPON

VICTOR J. EVANS & CO.
Registered Patent Attorneys: Established 1898
MAIN OFFICES: 715 Ninth St., Washington, D. C.

BRANCH OFFICES: 1007 Woolworth Bldg., New York City; 1640-42 Conway Bldg., Chicago, Ill.; 514 Empire Bldg., Pittsburgh, Pa.; 828 Fidelity Phila. Trust Bldg., Philadelphia, Pa.; 1010 Hobart Bldg., San Francisco, Calif.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name.....

Address.....

"What would I do if I lost my job?"

SUPPOSE your employer notified you to-morrow that he didn't need you any longer? Have you any idea where you could get another position?

Don't have this spectre of unemployment hanging over your head forever. Train yourself to do some one thing so well that your services will be in demand. Employers don't discharge such men. They *promote* them!

Decide to-day that you are going to get the specialized training you must have if you are ever going to get—*and keep*—a real job at a real salary. It is easy if you really try.

Right at home, in the odds and ends of spare time that now go to waste, you can prepare for the position you want in the work you like best. For the International Correspondence Schools will train you just as they are training thousands of other men—no matter where you live—no matter what your circumstances.

At least find out how, by marking and mailing the coupon printed below. There's no cost or obligation, and it takes only a moment of your time, but it may be the means of changing your whole life.

Mail the Coupon To-day!

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6212-F, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineer	☐ Architect
☐ Electric Lighting	☐ Architects' Blueprints
☐ Mechanical Engineer	☐ Contractor and Builder
☐ Mechanical Draftsman	☐ Architectural Draftsman
☐ Machine Shop Practice	☐ Concrete Builder
☐ Railroad Positions	☐ Structural Engineer
☐ Gas Engine Operating	☐ Chemistry ☐ Pharmacy
☐ Civil Engineer ☐ Coal Mining	☐ Automobile Work
☐ Surveying and Mapping	☐ Aviation Engines
☐ Plumbing and Heating	☐ Agriculture and Poultry
☐ Steam Engineering ☐ Radio	☐ Mathematics

BUSINESS TRAINING COURSES

☐ Business Management	☐ Advertising
☐ Industrial Management	☐ English
☐ Personnel Management	☐ Business Correspondence
☐ Traffic Management	☐ Show Card and Sign Lettering
☐ Accounting and C. P. A. Coaching	☐ Stenography and Typing
☐ Cost Accounting	☐ Civil Service
☐ Bookkeeping	☐ Railway Mail Clerk
☐ Salesmanship	☐ Grade School Subjects
☐ Secretarial Work	☐ High School Subjects
☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning

Name.....

Street Address.....

City..... State.....

Occupation.....

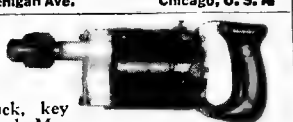
If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal

Learn Photography at HOME

Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book, *Opportunities in Modern Photography*, and full particulars.

AMERICAN SCHOOL OF PHOTOGRAPHY
Dept. 1423 3601 Michigan Ave. Chicago, U. S. A.

$15 Electric Drill



¼ in. Steel Chuck, key operated. Universal Motor. A sturdy tool for wood or metal. Fully guaranteed. Postage paid.

GEO. M. STUDEBAKER, Jr., C, South Bend, Ind.
512 Citizens Bank Building

Radio Speaks from Clocks and Books

By Volney D. Hurd

(*Continued from page* 993)

to the arm of your favorite chair can be built and this little receiver installed therein. The speaker may be included in this table or installed across the room and you can tune at the chair and hear the tone from across the room, which is as it should be.

If you have a grandfather's clock, this receiver can be hidden in its generous depths. This chassis may be made to take the place of a drawer in a buffet and you can control the music with your meals. If you have a favorite phonograph, this chassis will slip into a bit of the space used for record storage.

How many times have you wished to have your winter set at your summer home? These days so many summer places have electricity. You couldn't have a bulky cabinet moved down but this little chassis could be slipped out and a small speaker taken along and your summer radio problems solved. With many of the hotels in the country using alternating current this chassis could be built into a suit case for the travelling man and he would have good music wherever he landed.

In fact, there are so many ways such a chassis may be utilized that it would take much more space than we have to enumerate them all.

From a straight receiver viewpoint, this year is seeing the placing of many varied types of cabinets on the market by first class furniture manufacturers which are designed with small openings for just this type of installation. These run from small apartment miniatures to huge impressive period types. If grandeur is desired some of these larger models, with a chassis slipped in and a good speaker in place, will give a most impressive effect which is not at all lessened when the set is turned on and the dynamic speaker pours forth the quality obtained with shield grid R. F., power detection, resistance coupled audio, and a real power tube.

Build Your Own Tilt-Top Table

By H. L. Weatherby

(*Continued from page* 999)

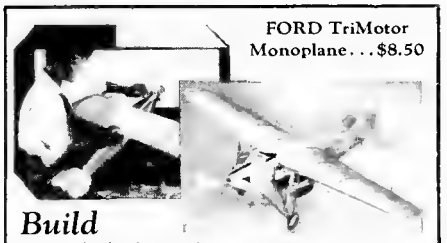
the turned surface and the hexagon will give lines on which to square and center the mortises. Before boring for the two mortises located on the corners, the corner wood should be chiseled off, giving a flat surface on which to work.

The turning is straight spindle work. Due to the size of the piece it should be turned slowly to start with and the speed increased as the work becomes round, with probably a maximum speed of not more than twelve to eighteen hundred revolutions per minute.

Fitting Is Simple Work

SINCE the mortises are already cut, it is a simple matter to shape the three spreading feet and fit them to the leg, after which the fitting of the top to the pedestal finishes the construction operations.

Since the top is to tilt, some means of making it a rigid job and yet providing it



FORD TriMotor Monoplane . . . $8.50

Build Model Airplanes *the* IDEAL way!

Plans for Model Airplanes 25c each

FORD MONOPLANE
Fokker Monoplane
New York-Paris Plane
Curtiss BiPlane
De Haviland BiPlane
NC 4 Naval Seaplane
Bleriot, Nieuport or
Taube Monoplanes
Cecil Peoli Racer

Build the FORD MONOPLANE the plane Comm. Byrd flew over the South Pole. 3 ft. Model illustrated above. IDEAL Construction Outfit, with Plans, contains everything required. Price $8.50

Ask your dealer or order direct. 48-page Catalog Model Airplanes, Parts and Materials for Builders 5c

IDEAL AEROPLANE AND SUPPLY COMPANY, Inc.
22-24 West 19th St., N.Y. City.

See the Craters in the MOON!

Astronomical and Terrestrial TELESCOPE Magnifies 30 Times

Own a genuine Astronomer's Telescope. See thousands of miles away. Make Sun, Moon Planets, Stars your next door neighbors. Moon Craters, Sun Spots, Eclipses, Comets enlarged 30 times. Strange thrills!

Price Only $2.95

Hours of fun looking at scenery, games, bathing beauties. Great for trips and voyages. Made like telescopes used in observatories. Gerding wrote, "Moon seemed 10 yards away."

See Landscapes, Games, Ocean Scenes, Enlarged 30 Times!

Diameter 2 inches. Special friction adjustment for focusing. Adjustable bracket and clamp can be fastened to chair, fence, branch, etc. Finest materials. Will last a lifetime.

Five Days' Free Trial

Rush only $1.00 now. Pay balance ($1.95 plus postage) when postman delivers. Keep 5 days. If not delighted, return telescope and money will be refunded.

EARN $10 A DAY
Charge 25c to look at the moon

R. B. SPECIALTY CO.,
Dept. C-335
220 E. 3rd St., Cincinnati, O.

SEND FOR THIS

FREE BOOK

OF SELF HELPS

New practical working methods for Aviators, Radio Men, Inventors, Engineers, Mechanics, Automobile and Battery Men, Electricians, Contractors, Carpenters, Painters, Decorators, Artists, Advertisers and other technical men. Over 200 books covering practically all kinds of mechanical work. *Write for your free copy today.*

FREDERICK J. DRAKE & CO., Publishers
Room 510 179 No. Michigan Blvd., Chicago

I Positively Guarantee

to increase your arms one-half inch in size, chest one full inch, strength 25%, health, 100% in one week's time, by following my instructions and using my exerciser 10 minutes mornings and at night. Send $1 for complete course and exercisers. Satisfaction guaranteed or $1 refunded.

Prof. J. A. DRYER
Box 1850-L Chicago, Ill.

Learn Write

Begin Today. Write for My FREE BOOK. I can make a good penman of you at home during spare time. Write for my **FREE BOOK, "How To Become a Good Penman."** It contains specimens and tells how others mastered penmanship by the Tamblyn System. Your name will be elegantly written on a card if you enclose stamp to pay postage. Write today for book.

F. W. Tamblyn, *4?4 Ridge Bldg.*, Kansas City, M

Write for Information About the NEW

H-F-L MASTERTONE

Laboratory-Made Receiver

The year's outstanding Radio Achievement

HIGH FREQUENCY LABORATORIES
28 N. Sheldon St., Dept. 25, Chicago, Ill.

with a pivoting arrangement must be devised. This may be done in a variety of ways, but the method suggested will probably be about as satisfactory as any.

A rectangular piece of wood 2″×5″×6″ is securely fastened to the top of the post with screws. This piece must be rounded on the front end to permit the top to tilt. Two cleats 1″×2″×15″ are fastened to the under side of the top, running across the grain of the wood in the top, one on either side of the piece that is fastened to the post. Hard wood dowels are glued into the piece attached to the post and turn freely in the cleats. A locking device is attached to the top at the opposite end from the pivoting arrangement. This may consist of a small bolt, such as used for locking doors or an elbow catch.

Finishing

TO finish the table in keeping with the period in which it orginated, an oil finish will be easily applied and will bring out the grain of the wood as varnish will not do. Boiled linseed oil is used and rubbed in. Use the oil thinned with about three parts of turpentine. This is rubbed on, using cotton waste or rags and the surface is rubbed dry. Three or four coats at twenty-four hour intervals should be applied, each one rubbed hard and dry. This means hard work, but the success of the job depends upon the hard rubbing. Be careful to always burn up the pieces of oil waste, since these are particularly liable to spontaneous combustion.

Is It Going to Rain?

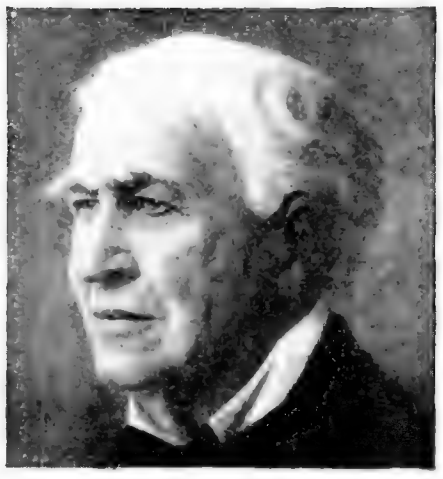
(*Continued from page* 1007)

"storm glass" or "paroscope" is a thermoscope rather than a hygroscope. The more or less flaky appearance of the liquid it contains depends upon temperature. This instrument has no value whatever as an indicator of coming weather, despite the extravagant claims once made in its behalf by Admiral Fitzroy, the first director of the British meteorological service, who devotes an entire chapter to it in his well-known "Weather Book."

The "weather plant," known to botany as *Abrus precatorius*, acquired notoriety in the nineteenth century. An Austrian named Nowack claimed to be able to predict from the positions of its leaves and branches a variety of mundane events, including earthquakes and mine explosions. Taking his vegetable wonder to London, he interested the Prince of Wales, and secured a letter of introduction to the authorities at Kew Garden. Here the alleged prophetic powers of the plant were investigated. Eventually Nowack's claims were pronounced absurd.

One of the most popular weather prophets in the Old World—especially in Germany and Switzerland—is the tree-frog or tree-toad. Kept in a jar of water with a little ladder, the creature is supposed to climb or descend according to the weather in prospect. Ofttimes a leech is used. As it can creep up the side of the jar containing water, no ladder is required.

A truly remarkable instrument, shown at the Great Exhibition of 1851 in London, consisted of twelve jars, each containing a leech. A bell rang whenever one of the imprisoned martyrs clambered to the top of his jar. The inventor, Dr. Merriweather, called this merry weather wonder the "tempest prognosticator." He published a book about it, and advised the government to establish storm-warning stations, equipped with "prognosticators," along the British coasts!



When Thomas Edison
groped in the dark

Now everyone can be well read

IN 1860 Edison was a newsboy on the trains in and out of Detroit. He spent every hour he could spare in the public library "grappling bravely with a certain section, and trying to read it through consecutively, shelf by shelf, regardless of subject."

Admirable determination! Edison was destined to be well read, just as he was destined to become the greatest inventor of all time. But his early desire for fine reading was a blind groping in the dark. The books in a modern public library would take 50 lifetimes to read!

Just as America's greatest inventor brought light into the world through the great medium, electricity — America's greatest educator brought light to everyone through the medium of good reading. Dr. Charles W. Eliot, from his lifetime of study, selected the pure gold from the world's literature. Into a single set he assembled the essentials of a liberal education, the books that everyone must know to be well read. In the Five-Foot Shelf are the carefully selected writings of 302 immortal authors.

DR. ELIOT'S FIVE-FOOT SHELF OF BOOKS

(The Harvard Classics)

Before you spend another penny for books, get a copy of "Fifteen Minutes a Day"—the famous booklet that tells how to turn wasted minutes into growth and increased power. It's ready and waiting for you. Sending for it does not obligate you in any way.

Carlyle once said, "If time is precious, no book that will not improve by repeated readings deserves to be read at all." Time nowadays is more precious than ever before. We can not, like the young Edison, attack the countless shelves of public libraries. Probably none of us possesses the persistency and patience which guided his early reading. We must have only the really great literature, the books that make us think straight, talk clearly and increase both our power to succeed and our enjoyment of life.

The Harvard Classics answer these requirements to the last detail. Already they are read and cherished in thousands of cultured homes. They are constantly bringing keen enjoyment and deeper understanding into busy lives. "Reading," as Edison himself says, "will never take the place of doing, but it enables us to travel twice as far with half the effort."

The Five-Foot Shelf is not a "rich man's library." By the famous Collier plan these wonderful books are brought within easy reach of everyone. Do not put off finding out more about this invaluable set. Mail the coupon today!

The Famous Booklet, FREE

P. F. Collier & Son Dist. Corp.
250 Park Avenue, New York City

Since 1875 COLLIER Good Books

By mail, free, send me the booklet that tells all about the most famous library in the world, Dr. Eliot's Five-Foot Shelf of Books (The Harvard Classics). Also, please advise how I may secure the books by small monthly payments.

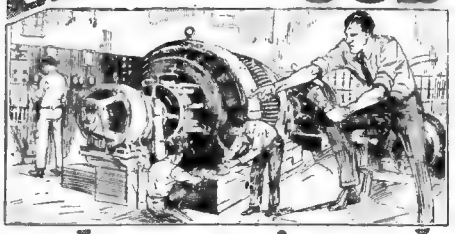
NAME { Mr. / Mrs. / Miss } .....

ADDRESS .....

.....

8024-HCLB

An ELECTRICAL Job



when you're only Half Way Through!

Gentlemen:
Thanks to the consistent effort of the American School I have found an entirely satisfactory job doing Electrical construction and maintenance work.
(Signed)
W. B. McClellan,
Mason City, Iowa

"I have accepted employment with the Iowa Railway and Light Corporation starting at $125.00 per month, who wrote me a letter suggesting an interview.
Thanking you very much for your splendid co-operation, I remain, Yours truly,
(Signed)
Glen Vandehaar"
Leighton, Iowa

During the past few months we have placed HUNDREDS of our graduates and also *students when only half through the course*—in well-paid Electrical positions. These men are now on the high road to a real future in the world's greatest business—some in power plants—some in Electrical factories—others in the business or drafting or selling or radio end.

Go After the Big Money

The big Electrical Utility magnates have just laid down a TWO-BILLION DOLLAR program of new projects before President Hoover. Remember, that's *in addition* to the billions already invested and the millions of men already employed in Electricity.

Just think—how light, power, railroads, radio, telephone, telegraph, all manufacturing, automatic devices, home appliances—now depend on Electricity. That's a wonderful line to get into—because it has no "hard times" or unemployment.

And now it's easy to break into Electricity. In your spare time, right at home, you can now quickly master WIRING, MOTORS, GENERATORS, POWER PLANT EQUIPMENT and other fascinating branches of the work—and almost before you realize it, we'll be recommending you for your first Electrical position.

WHO ELSE
Wants A Good Electrical Job?

The letters shown at the left are just typical of HUNDREDS we'd like to show you. We want to tell you more about the wonderful chances waiting for you in Electricity—our *fastest growing* industry. Mail coupon for an interesting proposition we are making *right now* to ambitious men.

American School Dept. E-353, Drexel Ave. and 58th St., Chicago

AMERICAN SCHOOL, Dept. E-353
Drexel Ave. and 58th St., Chicago, Ill.

Please send me without cost or obligation your Electrical bulletin, and tell me about your combined training and employment service in line marked X below.

☐ **ELECTRICAL ENGINEERING**

☐ Drafting	☐ Business Management
☐ Architecture	☐ Accounting
☐ Building	☐ Mechanical Engineering
☐ Structural Steel	☐ Shop Superintendent
☐ Civil Engineering	☐ Foremanship
☐ Auto Engineering	☐ High School in 2 years

Name.....
St. No.....
City.....State.....
Age.....Occupation.....

SONG WRITERS!

Substantial Advance Royalties are paid on work found acceptable for publication. Anyone wishing to write *either the words or music* for songs may submit work for free examination and advice. *Past experience unnecessary.* New demand created by "Talking Pictures", fully described in our free book. Write for it Today—Newcomer Associates
764 Earle Building, New York, N. Y.

BURN YOUR NAME ON TOOLS
WITH THE
ARKOGRAF

Protect Your Tools From Theft. Write with electricity any name or design on the hardest and finest tools, or any metal, like writing with a pen. Outfit $3.50 Prepaid Anywhere. Illustrated circular free. Write today. Agents wanted.
ARKOGRAF PEN CO.,
1171½ E. Stark St., Portland, Ore.

Prepare to Welcome Feathered Friends

By Dr. E. Bade

(*Continued from page* 1004)

consists of pine, fir twigs or of thorns fastened together. Such a place is necessary to keep the natural enemies of the birds at a distance. If they are not kept away, then the birds that take advantage of the bounty offered will fall an easy prey. At the same time the characteristic of some of the smaller birds must be taken into consideration. They do not like to fly over long stretches of open ground but prefer to flit from shrub to bush and from bush to tree towards their feeding place.

On this feeding-place the corresponding food of the birds should be available. Bread crumbs and broken boiled potatoes are eaten by the sparrows. Others may eat this food, but it does them more injury than good. Berries and almost all kinds of seeds, such as fruit and mellon seeds, sunflower seeds and hemp seed, all are excellent bird food. Mix the seeds and give it to the birds on an old Christmas tree. Pour the mixed seeds in melted tallow, stir thoroughly and brush the melted mass upon the twigs of the tree. The tallow hardens on the branches and surrounds the seeds and keeps them from falling down to the ground. The birds visit the tree and eagerly pick out the seeds from the tallow. When the tree is covered with snow, the snow is easily shaken from the tree without at the same time shaking off the seeds. If a tree is not used, a small shelter must be made, one that is covered overhead. At the same time it is wise to provide drinking water a few times a day on the colder days.

Although a good part of the nesting facilities of the birds have been destroyed, they can easily be replaced by providing bird houses. Naturally the type of house must be adapted to the kind of a bird that is to nest in it. Simple boxes with a hole and hung any old place are practically without value, the birds refuse to use them. Even correctly built bird houses are not used for nesting purposes if they are incorrectly located.

Bird houses should be built of wood and the entrance hole should be just large enough so that the desired bird can slip in easily. Then, too, the size of the bird governs the size of the house which it will use. A small bird requires a small house, a large bird a large house. When attaching the bird houses to trees be careful to see that they hang vertical and that they do not have an independent motion of their own. Attach them firmly with nails or screws to a thick branch, Never use a thin pole, especially not if it is exposed to the wind and free of underbrush. Before attaching a bird house, see to it that the entrance hole does not face the direction of the prevailing winds.

In the larger gardens it is advisable to provide thick shrubbery for the nesting places of those birds that will not build in bird houses. At times the birds will not take advantage of such nesting localities during the first year. This is due to their distrust, but winter feeding will overcome it quickly, and will also attract the summer songsters, for the birds have a language of their own and they will quickly congregate where they are not molested.

It's a BULOVA—Sent with a Mesh Band! For $1.00

TAKE 12 MONTHS TO PAY

Send $1.00 with order and tell us a little about yourself: (A) How long at present address, (B) Age, (C) Married or Single, (D) Name of Employer, (E) Position (F) How long employed. All information held **strictly confidential.** We make no direct inquiries of anyone—not even from your employer.

10 Days Free Trial—Satisfaction Guaranteed

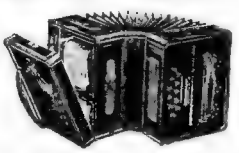
This genuine **Bulova** watch comes to you postage paid—**no C.O.D. to pay** on arrival. You take no risk—satisfaction guaranteed or money back.

Estab. 1895

$29.75
DG5-
15 jewel BULOVA gent's wrist watch. White Gold filled case; "dust-tite" protector; radium dial and hands; latest woven mesh wristband. Guaranteed. $1 now. $2.39 a mo. *Nationally advertised cash price, no extra charge for credit.*

Catalog FREE to Adults — New catalog of genuine diamonds, standard nationally advertised watches, fine jewelry. Write for it now.

ROYAL DIAMOND & WATCH CO.
ADDRESS DEPT. 110-C, 170 BROADWAY, N.Y.



AUTOMATIC ACCORDION

Played with Music Rolls. Musical Entertainers wanted at Radio Stations, Moving Pictures, Vaudeville, Restaurants, Cabarets, Dances, Weddings, Fairs, Parties, etc., receiving $5.00 to $10.00 per evening. You can earn big money with the AUTOMATIC ACCORDION, played with Interchangeable rolls. Attractive professional cards furnished free, bring you income for lifetime. You play perfect like an artist in few minutes, any songs, dances, operas, etc., without any idea of music or notes, without study or practice. Three models, for Home, Entertainments and Concerts. $30.00 to $60.00. Music rolls free. Write for circular No. EA.

The Latest Instrument Played with Music Rolls

CORNETINO

Full size Cornet plays wonderfully, sweet tone. Extremely simple. A child can play perfect. Nothing to get out of order. Finest instrument for home and outdoors. $7.50 and free rolls. Ask for circular No. EB. $10,000.00 deposited in the Bank of United States in back of our guarantee covering every instrument.

TREASURE SALES COMPANY
1690 Boston Road New York, N. Y.

TRUSS USERS

Learn how to close the rupture opening, so the rupture can't come down. Get a Ten Day Test of the herbal muscle-tonic "Plapao", and 48 page illustrated book describing the effective home treatment used by satisfied thousands without delay from work. Awarded Gold Medal, Rome, Grand Prix, Paris, and other proofs of merit. You can make this test which started many others on the road to better health without cost—FREE. Write TODAY to Plapao Co., 375 Stuart Building, Saint Louis, Missouri.

NO JOKE TO BE DEAF

—Every Deaf Person Knows That

I make myself hear, after being deaf for 25 years, with these Artificial Ear Drums. I wear them day and night. They stop head noises and ringing ears. They are perfectly comfortable. No one sees them. Write me and I will tell you a true story, how I got deaf and how I make you hear. Address

Medicated Ear Drum

GEO. P. WAY, Artificial Ear Drum Co. (Inc.)
68 Hoffman Bldg., Detroit, Mich.

$4.99 **22 Cal. Blank Automatic**

WITH 100 CARTRIDGES Free! You need no license or permit to own this 6 shot Automatic. Use for fun or self-defense. Keeps away stramps, frightens thieves, scares away dogs—A real home protector. Fool your friends. Same as an expensive automatic in construction, finish, appearance, durability; automatic magazine loading and ejection of cartridges, instant and powerful report. Guaranteed absolutely safe. Send no money. Pay on delivery $4.99 plus shipping charges. 100 cartridges.

NO PERMIT REQUIRED

6 SHOT

JENKINS, 683 Broadway, New York, Dept. 24-J-3

Curtiss "Tanager" Wins $100,000 Safety Prize

(*Continued from page* 985)

showed that to get the best lift out of the automatic slots, mechanisms which had been used up to this time were inadequate and a new type of roller support was developed. This installation is entirely automatic and is easily adjusted so that all slots over the span open simultaneously. The slots start opening at about twelve degrees angle of attack of the airplane and open gradually to their maximum position at sixteen degrees angle of attack. They are provided with buffers, so that there is no sudden opening nor jar in the ship caused by the operation of the slot.

"The flaps in the back of the wings are operated by a crank in the cockpit, this being the only added control. All other controls are normal. About ten turns of the operating crank are required to manipulate the flaps, and when not used, the crank, which is at the pilot's right hand, can be turned back out of the way. The ends of the flaps are provided with cloth shields which come into operation when the flap is down, reducing the tip vortices or air disturbances at the end of the flaps.

Unusual Landing Ease Obtained

"THE Tanager has been landed repeatedly from a height of 200 feet by rolling the stabilizer all the tail heavy, pulling the stick all the way back and holding this position until the landing is effected," continues Mr. Osborn. "This condition will throw many ships into a spin. When the controls are in these positions, the Tanager settles in a landing attitude and lands itself with no greater shock in the cabin than accompanies a normal landing. This method of landing could be used from any height, it is believed, as the ship does not gain speed, but continues in a normal glide in the landing attitude. There is no tendency to fall off on either wing, nor to oscillate about any axis, and all controls are effective."

The cabin of the Tanager is designed to accommodate three persons in a single row, but for ease of ballasting for the Guggenheim contest only two seats were installed. Dual controls are provided. There is a door on each side of the ship opening with the hinge at the top. These doors facilitate entering and leaving the ship, and are safer for emergency use than the usual type of door. The engine is a stock Curtiss Challenger, of the type used on the St. Louis Robin, which established a world's refueling record of more than 420 hours.

Ship and Shore Linked by Phone and Radio

By George R. Brown

(*Continued from page* 990)

A transmitter, operating on a wave-length of 34.0 meters was installed on the *Leviathan*. Much time elapsed before the apparatus was completely installed in both the transmitting and receiving stations in New Jersey. During that time many exhaustive tests and experiments with transmitting and receiving apparatus, interference with the ship's telegraph service, and the extraneous noises which occur on the phone were performed. The culmination of all this intensive and extensive work was the inauguration, on December 8, of the first commercial ship-to shore-telephone service.

MODERN ART PAYS BIG MONEY

The amazing demand for art work of all kinds is creating hundreds of big-pay opportunities every year. Trained artists are needed. This is the Age of Color . . . of Design . . . of Art in everything. Manufacturers, decorators, publishers . . . all are seeking men and women with art training.

Through the Federal School of Illustrating many who drudged at small pay have found fascinating careers . . . large incomes. Hundreds of Federal students are now earning from $2500 to $6000 a year . . . many even more.

You can learn at home . . . in your spare time . . . the Federal way. Earn while you learn . . . most of our students do. The Federal Course is for practical artists who MUST make good. It aims at dollars and cents profit for every student.

More than fifty famous artists . . . masters of modern art . . . contribute exclusive lessons and drawings to the Federal Course. They tell you how they create new . . . striking . . . clever . . . art work. They give you their technical tricks in illustrating, cartooning, lettering, designing, etc.

Test Your Talent Free

Send for our Free Vocational Test Chart. It's simple to fill out. Our artists judge it for you and give you a definite guide to your probable talent and earning power in art. We will also send you, without charge, "A Road To Bigger Things," giving names of the famous Federal instructors . . . showing where the big money in art is . . . what others are making. Get this Book and the Test Chart. Write now.

FEDERAL SCHOOL of ILLUSTRATING

3330 FEDERAL SCHOOLS BUILDING MINNEAPOLIS, MINNESOTA

Federal School of Illustrating
3330 Federal Schools Building, Minneapolis, Minnesota
Please send me free book, "A Road To Bigger Things," and Standard Art Test.

Name_____

Age_____ Occupation_____

Address_____

ELECTRICAL ENGINEERING
BOOKS SENT FREE

New Edition Containing 100 Pages on

A-C RADIO!

8 FLEXIBLE MAROON VOLUMES
4300 pages, 3200 illustrations, deluxe gold stamped binding. Index in each book, general index in Vol. 8. Covers every subject in Electricity—Light, Power, Transmission, Generators, Motors, Switchboards, Radio, Telephone House Wiring Railways, etc.

We're glad to send a set to your home to examine and use as your own for 10 days—to show you that here is the most up-to-date and complete work on Electricity ever published. Written by CROCKER of Columbia U.—MILLIKAN of Calif. "Tech."—HARRISON of General Electric and 26 other noted Electrical Engineers. Starts off with elementary Electricity in simple, non-technical language for the beginner and includes every Engineering branch for use of experts on the job.

Complete Electrical Reading Course

Electricity, the biggest industry in the world, continues to grow the most rapidly. And it offers better jobs, bigger salaries and a brighter future than any other field. *Every dollar, every hour invested in learning Electricity will come back to you a thousand-fold.* Learn in spare time with these books at *one-fifth* the cost of trade courses. Outline for organized study, quiz-questions and a year's free consulting membership in the American Technical Society *included without extra cost*, if you mail coupon immediately.

Look it up!
Thousands of these sets are used as REFERENCE books by men employed in electrical, building construction and allied lines. The JIFFY INDEX puts the answers to 20,000 questions right at your finger tips.

AMERICAN TECHNICAL SOCIETY
Dept. E-325
Drexel Ave. & 58th St., Chicago

American Technical Society
Dept. E-325 Drexel Ave. & 58th St., Chicago

Please send for 10 days' free trial 8-volume set of Electrical Engineering just off the press, subject to return if I wish to. (I pay the few cents express charges on receipt of books, you pay express if returned.) If I decide to keep them, I will pay $2.00 after 10 days trial, then $3.00 a month until $34.80, special advertising price, is paid, after which books become my property. Year's Consulting Membership to be included free.

Name.....

Address.....

Employed by.....

Employer's Address.....

LearnAVIATION
WHERE LINDBERGH STARTED!

GET TRAINING THAT ASSURES SUCCESS!

Learn where "Lindy" learned—at Lincoln! Get *complete, thorough* Aviation training. Attend the Lincoln School. One of the largest, finest equipped civilian aviation schools in U. S. Complete courses in flying and airplane building and mechanics. Planes and pilot and mechanic instructors carry the Dept. of Commerce license. Write for FREE Literature, stating age!

LINCOLN AIRPLANE & FLYING SCHOOL
229 Aircraft Bldg. Lincoln, Nebr.

Fifty-Shot Target Practice Air Automatic
$3.98
Box of Ammunition Free.

Guaranteed to hit a fly at ten feet. The ideal pistol for target practice. Get one today and become a good marksman in short time and at very little expense. Shoots buckshot with accurate precision and great force. Holds fifty shots in magazine. Easy to reload. Excellent for hunting birds, etc. Looks like a real pistol. SEND NO MONEY. Pay on delivery $3.98 plus small express charges.

JENKINS, Dept. 24-W-3 685 Broadway, New York

450 Miles to the Gallon

By Alfred M. Caddell

(*Continued from page* 1018)

Carburetor Adjustments Most Important

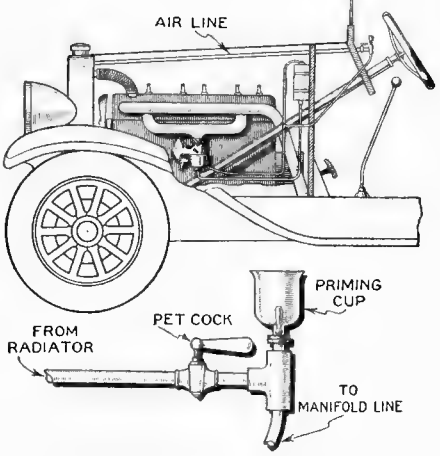
TESTS made at the Government Fuel Yard by the Bureau of Mines revealed that motorists operate their cars with too rich a mixture. This results not only in less mileage per gallon but in excess carbon and a consequent multitude of motor ills.

The efficiency of various carburetor settings was determined by the analysis of samples of exhaust gases. Then new carburetor adjustments were made to achieve economy without the least sacrifice of flexibility of operation and power. In all but one case the original mixtures were too rich for efficient operation.

The tests showed that the carbon dioxide indicator used for testing the exhaust gases gave a positive indication of the carburetor adjustment. The indicator in question is entirely practical and should prove invaluable to companies having ten or more large trucks in service.

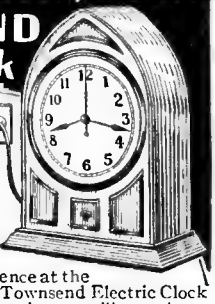
A Simple Gas-Saving Installation

AS one of the multi-million automobile-aires, the writer conducted experiments on several makes of cars and proved most conclusively that *miles per gallon* could be increased one-third simply by permitting moist air to enter the intake manifold after the motor had been warmed up. The system has been tried on the Ford, Buick, Willys-Knight, Pierce-Arrow, Studebaker, Essex, and Hupmobile cars, thus providing ample opportunity for observation and check. As one example of the results obtained, an old 1918 Buick, which formerly did about 12 miles to the gallon, was stepped up to 18. On a 530-mile run, slightly less than 30 gallons were consumed. The car was loaded to capacity, carrying six passengers and a camping outfit.



The system is simplicity itself, consisting of a petcock and copper tubing, with the necessary connections. A copper tube runs from the top of the radiator—about three inches above the water-line—to the dash. Here it passes through a petcock, from which another copper tube extends to the line running from the vacuum tank to the intake manifold. In the case of the Ford, a hole was drilled in the intake manifold, permitting moist air to mix with the gas-air vapor as it is drawn into the cylinders.

Now-Observatory Time WITH TOWNSEND Electric Clock
ONLY $5.95!



Just Plug Into Light Socket and Forget It

It's here! The greatest new convenience of electrical science at the lowest price on record! The Townsend Electric Clock gives **exact time always.** No springs, you'll never have to wind it. Comes in beautiful dark walnut Bakelite case, as illustrated—7¼ in. high, 3¼ in. dial.

Send Only $1 deposit. Your Townsend Electric Clock will be sent immediately C. O. D. for $4.95 and postage. The Townsend is guaranteed to be equal or superior to any clock, regardless of price. If you do not find it so—or if for any other reason not satisfied, return it and your money will be refunded. Order today!

TOWNSEND LABORATORIES
725 Townsend Street
Chicago, Ill.

NO SPRINGS NO WINDING

Wouldn't You Like to Have Your Own Business?

TO HAVE an extra, independent income? To work whenever it suits your convenience? Make a host of new friends and gain valuable experience from contact with other people? Have money to buy the 101 things you've always wanted but felt you couldn't afford? Know the happiness that comes from doing something really worth while.

Then our easy money-making plan offers a splendid opportunity to gratify your desires. Hundreds of men and women, young and old, 95% of whom were inexperienced beginners when they started, are earning substantial profits. You can also. All you need is a few spare hours to take care of the new and renewal subscriptions for Science and Invention, Screen Book, Radio News, Aero Mechanics, Plain Talk and our other magazines.

IMMEDIATE PROFITS

You begin earning money at once—the very first hour you start. Besides liberal cash commissions, you also receive monthly bonus checks. If you feel at all interested send the coupon below. It costs only a two-cent stamp, but may lead to a substantial income. We're so sure you will succeed that we supply everything you need free of charge. Every day you delay is a money-making opportunity lost, so

Mail This Coupon Now!

The Mackinnon-Fly Publications,
61-C
381 Fourth Ave., New York, N. Y.

Without obligation to me, please send me full details of your easy money-making plan.

NAME .....

STREET .....

CITY ..... STATE .....

It is surprising how a motor thus equipped picks up in revolutions without the addition of any gas-air mixture whatever. Besides increasing motor speed, and consequently motor power, the device reduces the amount of carbon deposited in the combustion chambers. Because of the complete combustion, no doubt, one motor was found practically carbon-free after a year's use. The system works well with all grades of gasoline.

Unquestionably, greater mileage per gallon may be obtained by any motorist who keeps his carburetor properly adjusted, or who permits moist air to dilute the gas-air mixture after a motor has been warmed up; who attends to proper lubrication, proper inflation of tires, etc. Speaking of diluting the gas-air mixture, it will be recalled that there are several automatic devices on the market purporting to accomplish this automatically. However, it is the writer's experience that such devices, not knowing when the motor is warm enough, can scarcely be expected to perform as satisfactorily as the human intelligence or thermometer which tells the heat condition of a motor. If carburetors are set to provide a rich mixture for starting and cars are run on this mixture continuously, a saving in gasoline is hardly possible with such automatic devices, but if moist air is permitted to enter by hand control a considerable operating efficiency will result. Carburetors should be adjusted with air on after the motor has become thoroughly warmed.

Another saving in gasoline may be effected by priming a cold motor with about half a thimbleful of a mixture of gasoline and ether, mixed in proportion of one part motor ether and two parts gasoline. The volatility of the ether permits instant firing of a cold motor, which thereupon picks up the less volatile gasoline vapor and presto! the motor is under way. This slight detail saves choking the gas. Not only does the excess of gasoline mean lost money, but it washes the lubricant from the cylinder walls and finds its way to the crank-case, where it dilutes the lubricating oil and destroys its lubricating qualities. A gas-saver and a cuss-saver, the little priming cup, which may be installed in the air line leading from the dash, is one of the best minor attachments anyone can put on his car.

$5,000 FOR PERPETUAL MOTION

The editors have received thousands of different designs of perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stock for these perpetual motion machines are being sold at a rate of $1.00 per share, although some inventors are trying to sell shares of stock at $10.00 per share.

Therefore, the editors of this publication say, "Just come in and show us—merely SHOW us—a working model of a pepetual motion machine and we will give you $5,000.00. But the machine must not be made to operate by tides, winds, waterpower, natural evaporation or humidity. It must be perpetual motion."

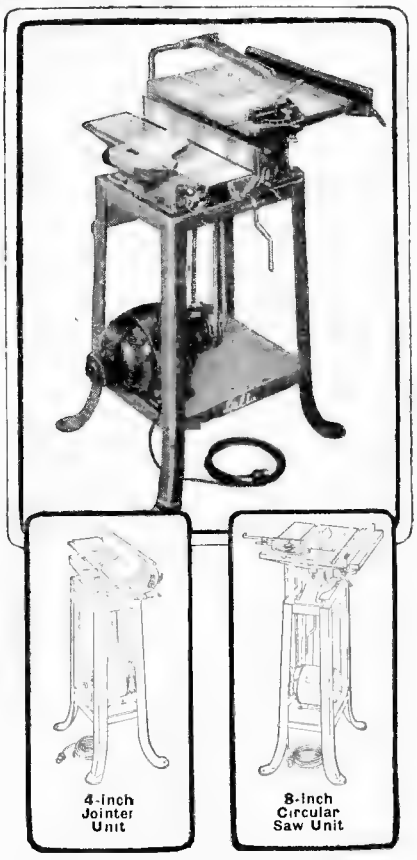
Enjoy the Thrill of Making Things Quickly and Easily

with the NEW 1930 Delta Electric Handi-Shop

Craftsmen, artisans, farmers, mechanics—all who use wood in their daily labors or spare-time hobbies—are delighted with the sturdy construction, splendid efficiency, and moderate cost of this Delta equipment. They appreciate keenly in the "Handi-Shop" such exclusive constructional features as the Patented Tilting Tables, Automatically-Oiled Bronze Bearings, Heavy U-Shaped Lathe Bed, and Circular Saw Raising Lever. Send coupon for complete description of this remarkable workshop.

New Woodworking Units

The introduction of the Delta Jointer and Circular Saw Units marks a new era in moderate-priced woodworking equipment. Now, for the first time, are available sturdy, practical machines in compact, convenient form at price levels astonishingly low. The combination unit affords a compact, convenient arrangement which permits sawing and planing in one quick operation. Either Jointer or Saw can be operated separately or both together. Welded steel stand of convenient height. All three units are furnished with or without motor, as desired.



The individual units are built ruggedly to give years of heavy service. Both incorporate many special features of great value. Furnished with or without motor.

10-Day Trial! Easy Terms

For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. Shows many items of interest to those who work with wood. You will learn, also, how you can try any Delta equipment for 10 days under actual working conditions at our risk. Choice of three convenient payment plans. Mail coupon TODAY!

New "Delta" Moulding Cutter

High speed blades produce over 10,000 cuts per minute at 3,500 R.P.M. Blades require no individual adjustment. Quickly and easily locked in position. Special guide fence. Unusually low price. Below are a few of the many shapes that can be made.

Cuts Over 50 Moulding Shapes With Only 4 Sets of Blades

DELTA SPECIALTY CO.
Division of
DELTA MANUFACTURING CO.
1661-67 Holton St. Dept. C-330 Milwaukee, Wis.

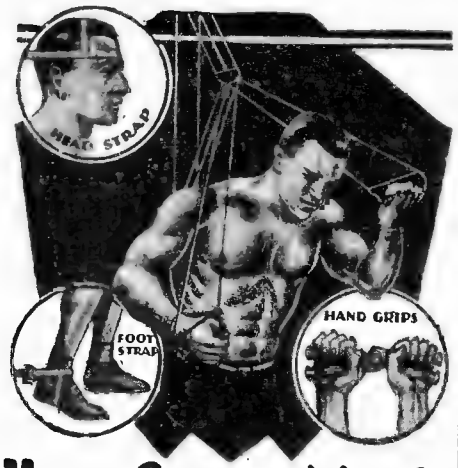
DELTA SPECIALTY COMPANY, Dept. C-330
Division of "Delta Manufacturing Co."
1661-67 Holton St., Milwaukee, Wis.

Please send me FREE, illustrated literature describing 1930 model "Delta" Woodworking Units. Also details of 10-Day Trial Offer and Easy Payment Plans. (Check special information desired.)

☐ Handi-Shop ☐ Moulding Cutter
☐ 4" Jointer Units ☐ 8" Circular Saw Unit
☐ Combination 4" Jointer and 8" Circular Saw
☐ I am interested particularly for home use
☐ I am interested for shop and professional use

Name.....

Address.....



Home Gym and Muscle Building Course $5.00

Realize your ambition and develop muscles of a super-man. **GET STRONG!** Easily master feats which now seem difficult—or if you want physical culture for your health's sake, this equipment is what you need. With this special offer you **SAVE AT LEAST HALF.** We furnish 10 cable chest expander adjustable to 200 lbs. resistance. Made of new live extra strength, springy rubber so as to give resistance you need for real muscle development. You also get a pair of patented hand grips for developing powerful grip and forearms. We include wall exercising charts which permit you to develop your back, arms and legs—a real muscle necessity. The head strap permits you to exercise muscles of your neck. Develop leg muscles with foot strap furnished. This gives speed, endurance. In addition you get specially written course containing pictures and diagrams showing how to develop any part of your body. **ACT NOW!**

Send No Money

Sign name and address to coupon and rush to us. We send everything by return mail. Pay postman $5.00 plus postage. (If you desire, send money order now and we pay postage.)

CRUSADER APPARATUS CO.,
Dept. 403, 44 Parker Ave., Maplewood, N. J.

I accept your offer. Send me everything described in your advertisement by return mail. I will pay postman $5.00 plus postage on arrival. It is understood if I am not entirely satisfied after examination, I can return the goods and you will refund my money.

Name_____

Street_____

City_____ State_____

Note—No C. O. D. orders to Foreign Countries or Canada.

Andy Sannella
Talks to Reed Players.
Get this Free Book!

On the air tonight, and **every night**, Andy Sannella is earning a **fabulous salary** with his Selmer Sax. In his book of "Advice to Saxophone Players," he gives **more valuable information** than in ten private lessons. This book also contains **Talks to Clarinetists by Alexandre Selmer.** Send for free copy.

If you will mention the instrument you play, we will send also, **free samples** of our Alexandre Reeds. **They Play!**

Selmer
276 SELMER BUILDING, ELKHART, INDIANA
(In Canada: 516 Yonge St., Toronto)
27

WHY NOT spend Spring, Summer and Fall gathering butterflies, insects? I buy hundreds of kinds for collection. Some worth $1 to $7. Simple work with my Instructions, pictures, price list. Send 10c (NOT STAMPS) for my Illustrated Prospectus before sending butterflies. **Mr. Sinclair, Dealer in Insects, Dept. 41, Box 1121, San Diego, Cal.**

Have a Basement Playroom

By S. Gordon Taylor

(*Continued from page* 987)

necessary to dryness and comfort. Where such arrangement is not practical, the same result may be obtained by installing a small ventilator or exhaust fan of the type used to ventilate kitchens. Or air-ducts may be extended from a grille in the partition to one of the windows in a different part of the basement.

In most basement conversion plans, good illumination is important. This phase of the problem also includes wiring and convenient outlets for lamps or other electrical appliances. Rigid conduit is best fitted for basement wiring, because it affords the utmost protection for both the wiring system and the structures. Lighting fixtures present no particular problem. Requirements in the basement are identical with those on the upper floors, and floor lamps may be used for lighting game tables or other features.

There is probably no portion of the house that offers greater opportunity for ingenuity in planning than does the basement area. Almost every phase of the design and treatment of basement space opens opportunities for the practical imagination. The handy-man will find real enjoyment in planning the basement for recreational or other purposes; and contact with his local building material dealer or with manufacturers will furnish him with data on the equipment and supplies necessary to carrying out his ideas. From these sources, too, he can obtain much helpful counsel on built-in wall cabinets, partitions, wall treatments and other features of his basement plan.

Book Reviews

THE BEGINNING OF CHEMISTRY, by Harriett Blaine Beale. Stiff cloth covers, 5" x 7½", 245 pages, illustrated. Published by Coward McCann, Inc., New York City. Price, $2.50.

In this book, the author has endeavored to tell in a simple manner, the story of chemistry and present this science in such a way as to arouse the child's interest, as well as prepare him for the subject which he must later study in school. He will become familiar with the terminology and gain a clearer knowledge of this science. The subject is made both understandable and fascinating, and has been intended for reading by children of pre-high school age. For adults desiring to know the fundamentals of chemistry, no better book could be chosen.

RADIO TELEGRAPHY AND TELEPHONY, by Rudolph L. Duncan and Charles E. Drew. John Wiley & Sons Inc., New York, 950 pages. Illustrated. Price, $7.50.

The authors of this up-to-the-minute book on the subject of radio have accomplished the aims of all popular scientific text books. In other words, they have treated a highly technical subject in a manner easily understood by the layman. The work is a veritable encyclopedia on modern radio. It covers completely and concisely everything in radio from the elementary to the most advanced. Motor generators, starters, storage batteries, vacuum tubes, receiving sets, A. C. operated receivers and tubes, commercial receivers, rectifiers, antenna design and construction, commercial broadcast transmitters, short wave transmission, arc transmission, radio direction finders and broadcast equipment give an idea of the many subjects covered

I made $93 my first week

—says J. W. Varner of Iowa "and I've earned over $100 a week selling the Stay-Prest Trouser Presser." Jack Ames made $24 in four hours. Randle sold twenty-five the first day. Mary Roberts cleared $10 one evening. You, too, can make big money selling this—

Wonderful New Invention

***Stay Prest* Trouser Presser**

Keeps pants always pressed without steam or heat! Fits any size trouser! Gives a knife edge crease—removes knee bag—smooths entire surface. Easy to use—takes just a few seconds. SAVES nap and beauty—ADDS to life of cloth. Durably made of hardwood—lasts years. Finished black leatherette—all metal smartly nickeled—looks rich—compactly folds—15 inch package—fits small handbag. Over 250,000 in use. STAY-PREST OWNERS ENJOY FRESHLY PRESSED TROUSERS EVERY MORNING AND SAVE $50 A YEAR. RETAILS FOR ONLY $2.50—WONDERFUL VALUE!

40% Profit

Every man wants one or more. Average sale made in 8 minutes. World's greatest quick seller and big repeater. Ten easy sales a day net you $10. MEN AND WOMEN THIS IS YOUR OPPORTUNITY!

AN HONEST FREE OFFER

To help you. Special Offer includes FREE Sales Kit!—everything you need to take orders. Write for offer, plan and exclusive territory.

Stay-Prest Co., Dept. M-44, Central Park Bldg. Cincinnati, O.

TOBACCO HABIT BANISHED
QUICK, SURE, LASTING RESULTS

In most cases, ***Tobacco Redeemer*** relieves craving for tobacco completely in a very few days. An absolutely safe, dependable, and thoroughly reliable treatment. No matter how long the habit, or in what form used, all craving for tobacco usually vanishes when this pleasant, inexpensive treatment is used according to simple directions. Your money returned without argument or question if not satisfied. Write for free explanatory booklet and proof of what ***Tobacco Redeemer*** has done for men addicted to the tobacco habit. Send post card or letter today.

NEWELL PHARMACAL CO.,
Dept. 884 Clayton Station St. Louis, Mo.

CORRECT Your NOSE

Improve your appearance with the ANITA Nose Adjuster. Shapes flesh and cartilage—quickly, safely and painlessly, while you sleep. Results are lasting. Doctors praise it. 68,000 users. Write for 30-Day Trial Offer and FREE BOOKLET.

ANITA INSTITUTE, 373 Anita Bldg., Newark, N. J.

I CHALLENGE

you that I will teach you, by mail, in one lesson, the simplest, shortest method. All for $1.00. Not telepathy. You can read one's mind to a dot, by only looking in the eyes of partner, chum, sweetheart, etc. Praised by New York, Boston, Montreal Police chiefs; colleges; Thurston; Blackstone, etc. If fake, let them arrest me.

A. HONIGMAN, Dept. Inv-11
Sta. E, P. O. B. 85 Montreal, Can.

"STAMMERING Its Cause and Cure"

You can be quickly cured if you stammer. Send 10 cents, coin or stamps, for 288 page cloth bound book on Stammering and Stuttering. It tells how I cured myself after Stammering and Stuttering for 20 years.

BENJAMIN N. BOGUE
12952 Bogue Building, 1147 N. Illinois St., Indianapolis

Here's the Second Step in Glider Construction

By Lieut. A. A. Reynolds

(*Continued from page* 1003)

ing two bolt nuts and two turnbuckles. The stabilizer framework is constructed first. A spruce stabilizer spar ¾"x2"-x8'-3" long, is shaped as shown in the drawing of the stabilizer spar. ¼" x ⅝" grooves are cut in its edges to admit the ends of the battens, and a ¾" x ¼" groove is cut at its center to admit the larger center battens. The ends of this spar are tapered as shown in the drawing. The ends of the battens are all nailed and glued in their respective grooves and triangular spruce blocks are inserted between them and against the spar, where they are fastened with glue and nails. ¾" half-round strips are fastened at both tips of the spar and to the free end of the ¾" x ¼" center rib battens. This forms the stabilizer leading edge.

Each of the ¼" x ⅝" rib battens are next attached to this leading edge. Strips of muslin are glued around the leading edge and onto the battens to strengthen their joints. Spruce blocks are cut to shape and glued and nailed betwen the top and bottom rib battens, as shown in the top and end view of the stabilizer drawing. The two ¼" holes shown at the ends of the ¾" x ¼" center rib batten are for mounting the stabilizer and should not be drilled at this time. The metal fittings F. 4, should be bolted into position on the back surface of the *stabilizer spar* with ¼" machine bolts. The free end of these metal fittings should project downward, as they are to be the fastenings for the two mounting wires later. Six hinges are bolted into position as shown in the drawing. The center hinge on each side should be as near the horn position as possible, to bear the control cable strain.

The right and left elevator frameworks are built next. Two elevator spars are cut ½" x 2" x 3'-11" long. The ends of these spars are tapered as shown in the elevator drawing. It is best to build both elevator frameworks at this time, so that all parts will be exactly alike. ¼"x⅝" grooves for the rib batten ends are cut in the spar edges, as shown in the elevator spar drawing. The four top and four bottom elevator rib battens are glued and nailed into these grooves on each spar. Triangular spruce blocks are fastened between these batten ends and against the inside surface of the spars. A¼" x ½" trailing edge is next fastened to the free ends of these battens using triangular wood blocks and glue. Muslin strips are glued over this trailing edge onto the batten ends. Wood blocks are next cut to shape and fastened between the top and bottom rib battens about half way from the trailing edge to the spar. This is shown in the elevator drawing end view. ¾" half round strips, tapered at the trailing edge ends, are fastened between th spar and trailing edge of each end of each elevator. Muslin strips should be glued over each of these joints. The horns should be fastened next, one on each elevator spar, as shown in the drawing. Wood blocks and triangular plywood gusset plates should be used at these horn attachments to make them very solid and secure. Two No. 30 piano wires are mounted as shown in small holes drilled in the blocks against the spars and trailing edges. No turnbuckles are necessary as the wires are simply drawn taut and secured. Each elevator is next lifted and placed against the stabilizer spar so that the exact places

(Continued on page 1043)

Go After the Big-Pay Job!

"Know electricity as experts know it and get an expert's pay"

DON'T be satisfied to worry along in little jobs with little pay. Master the finer points of electrical practice and bring the big-pay job within your reach. The man who knows electricity in all its many phases—the man who has completely mastered the subject from A to Z—can pick his own job and name his own salary. Learn the way to bigger pay. Become an electrical expert! Croft will show you how. Through his famous books he will teach you electricity as experts know it and put you in line for an expert's pay! Fifty-nine thousand men are using these books to step ahead—WHY NOT YOU?

Croft Library of Practical Electricity

7 volumes—2785 pages—2045 illustrations, flexible binding

No method of teaching electricity offers a quicker, surer way to success than the Croft books.

Starting right in with the ABC's of modern electricity, Croft takes you through his books in easy steps. He gives you the boiled-down records of every-day electrical practice in plain words, figures and illustrations. Nothing is left to the imagination—there is no guesswork.

59,000 Croft Sets NOW IN USE

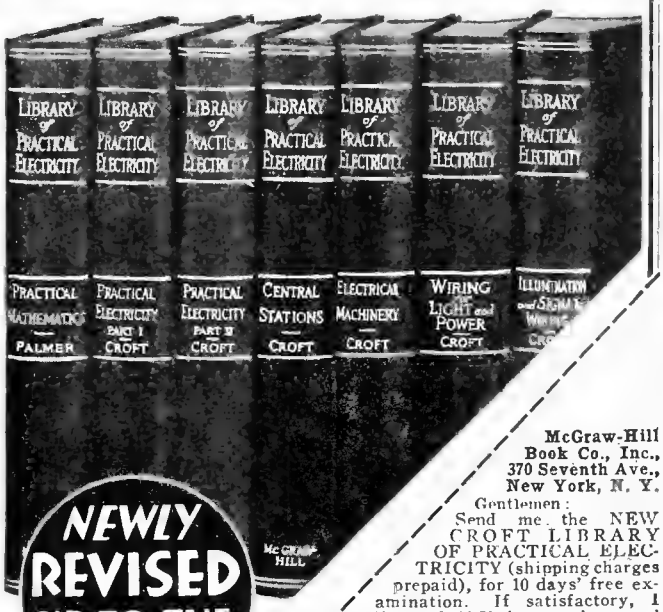
Croft has been through the mill. His knowledge of electricity has been gained by actual shirt-sleeve contact with electrical problems. He knows just what is needed to get ahead. He has poured out all his knowledge—all his experience—in language that anyone can grasp. Yet the text is so scientifically correct that thousands of the highest paid electrical engineers are using the books as a reference set.

The famous set is, beyond the shadow of a doubt, the last word in practical electrical education. No one who wishes to get anywhere in the electrical field can afford to be without it.

Thousands of Facts at Your Finger Tips

The Croft Library contains 2785 pages, with 2045 of the clearest illustrations ever put into book form. Each of the seven flexible pocket-size volumes are indexed so that everything you need to know is right at your fingertips.

Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—installation, operation and repair of electrical machinery—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—how to do a complete job, from estimating it to completion — illumination in its every phase—the latest and most improved methods of lighting, signal wiring, etc.


LIBRARY of PRACTICAL ELECTRICITY
PRACTICAL MATHEMATICS — PALMER
PRACTICAL ELECTRICITY — CROFT
PRACTICAL ELECTRICITY — CROFT
CENTRAL STATIONS — CROFT
ELECTRICAL MACHINERY — CROFT
WIRING and LIGHT and POWER — CROFT
ILLUMINATION — CROFT

The Standard in Practical Electrical Training

Everywhere the Croft Library is acknowledged as the standard — the leader—in practical electrical training. It is the daily guide of 59,000 highly paid electrical workers and engineers. There is nothing like it. It is the most complete, the best illustrated, the most carefully compiled, the most easily understood library of electricity in print today. No matter how much or how little you know of electricity you will find the Croft Library a sound, helpful guide to greater accomplishment.

NEWLY REVISED UP TO THE MINUTE

FREE Examination

No Money Down—10 Months to Pay!

So that you may test our statements, we offer to send the complete library of 7 volumes to you for 10 days' free examination. We take all the risk—pay all the charges. You assume no obligation of any kind—you pay nothing unless you decide to keep the books, in which event you pay $1.50 in ten days and then $2.00 a month for nine months.

Send the coupon now and see the books for yourself. It's a little thing to do but it may prove to be the best move you ever made in your life.

McGraw-Hill Book Co., Inc.,
370 Seventh Ave.,
New York, N. Y.

Gentlemen:

Send me the NEW CROFT LIBRARY OF PRACTICAL ELECTRICITY (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send $1.50 in ten days and $2.00 per month until $19.50 has been paid. If not wanted, I will return them. (To insure prompt shipment, write plainly and fill in all lines.)

Name . . . . . .

Home Address . . . . . .

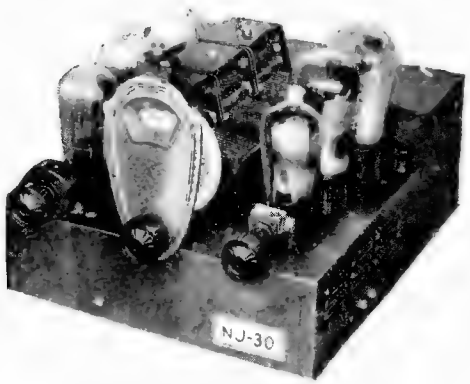
City and State . . . . . .

Employed by . . . . . .

Occupation S.I.-3-30

Concealed Radio?

Here It Is!



A modern, All-Electric 6-tube Chassis. For installation in any available square foot of space. Laboratory assembled with genuine National Company parts and National R. C. A. licensed Power-Amplifier.

Send for descriptive folder, mentioning Science & Invention, when you write.

3 Screen-Grid Tubes and two 245 Power Tubes. Tone up to the most modern standards. List price, (less speaker and tubes) $77.50. Wired and ready to use.

The NJ-30 CHASSIS

JACKSON RESEARCH LABORATORIES
Jackson Street, Malden, Mass.

Now! Do Your Own Electric Nickel Plating — Introductory Offer ONLY $6.50 Plus Postage

Make $150 to $500 a Week

No experience required. Do YOUR OWN Electro-Plating in Your Home, Garage, Office, or Place of Business. Electrically Deposit Metal Nickel, Brass, Copper, Silver or Gold. You can Successfully do all the plating on your Automobile, Electric Fixtures, Faucets, Spoons, Forks, Chandeliers, Tools, Coffee Urns, Surgical and Dental Instruments, Utensils large or small, Iron Stoves, Music Instruments; recondition worn plating or plate New Work; do it Instantly without interrupting the Service or without removing the parts to be plated with the

ALADDIN PORTABLE ELECTRO-PLATER

Simple and Economical to operate. Not a toy, but a practical Plating Outfit with which Perfect and Durable Work can be done. Positively Guaranteed to do as we claim. BE YOUR OWN BOSS! Build up a Profitable Aladdin Electro-Plating Business of your Own. This offers wonderful ECONOMY to users and BIG MONEY-MAKING possibilities to AGENTS. Thousands in Service. Write for FREE Booklet and Testimonials and 30-Day Trial Offer Today. AGENTS and DEALERS WANTED EVERYWHERE.

Thousands in Service since 1924 — P. J. F. BATENBURG CO., Dept. 161, RACINE, WISC.

BANKRUPT RADIO STOCKS

Fully Guaranteed

7 tube A. C. Chassis	$24.50
7 tube A. C. Sets in beautiful table model cabinets	29.75
250 Power Amplifiers	19.75
Short Wave Sets, one tube, complete with 5 coils; 30 to 550 meters	6 45
A. C. Power and Filament Transformer	4.00
A. C. Filament Transformer	1.95
16 Mfd. Condenser Blocks, 1000 volts	3.90
Tubes, UX type, guaranteed. No 250	2.35
No 281	2 00
No. 280	1.25
No. 245	1.25
No. 224	1.75
No. 227	.75
No. 226	.65
No. 171	.75
Audio transformers	.75
Chokes	.90
Variable Condensers	.50
Coils	.35
A B C Power Packs	8.75

250 volts of B. Also has A. C. filament for up to nine-tube sets. Can be used as B eliminator. Make your battery set all electric or build your new A. C. set around this Pack.

280 type rectifier tube for this pack, $1.25 extra

Send for Free List

CHAS. HOODWIN CO.
4240 Lincoln Ave., Dept. C-3, Chicago, Ill.
Bankrupt Radio Stocks

CHEMISTRY

Complete, practical home-study courses prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D.—Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D., Vice-president, United Chemical and Organic Products Co.; BRADLEY STOUGHTON, B.S.—Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

Mail Coupon for Free Booklet

INTERNATIONAL SCHOOL OF CHEMISTRY
Division of the
International Correspondence Schools
Box 6313-F, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in

☐ Analytical Chemistry ☐ Metallurgical Chemistry
☐ Chemical Engineering ☐ Short Chemistry Course
☐ Industrial Chemistry ☐ Pharmacy

Name .....

Address .....

Toy Figures Come to Life

By Don Bennett

(*Continued from page* 1019)

can be applied to jointed dolls and other figures. Professional studios often employ it to save the cost of expensive sets. Storms at sea are usually produced for the films in this fashion. Last year an article in SCIENCE AND INVENTION told how a model was used in depicting the sinking and rescue of a submarine. It would have been impossible to have photographed this as it happened, disregarding the item of expense. Models and a full-sized ark were used in combination for the photograph of Noah's Ark accompanying this article.

Possibly you remember "The Lost World." That was the finest piece of model work ever achieved. The models used in that picture were not over twenty-four inches high. Yet in some scenes they towered above the human actors. Double exposure was employed to gain this effect.

With a little ingenuity you can make a film playlet with jointed dolls and miniature sets. Select a story in which the action is simple, and costume your actors to fit. Construct a set to scale and furnish it with miniatures of everything the full-sized set would have. Light it with small lamps (200-500 watts) giving particular attention to the backlighting. Place the camera so that the set is viewed from the same angle as if it were full size. Then film your story as indicated in the first part of this article, making single frame exposures and moving the dolls slightly after each one. For example, a character is to make an entrance through a door. The door is opened in four or five frames. The first exposure is with the door just ajar, the second with the door swung to about ten degrees, the third at thirty degrees, the fourth at forty-five and the fifth at sixty. This is usually as far as a door is opened. You story will control the speed. If you wish the door to open slowly, move it about five degrees at a time; if you want it to fly open, open it twenty degrees at a time.

When a doll character walks, each step should occupy about eight frames. Because the feet must be raised from the floor part of the time, you will find it desirable to weight them with lead so that the doll may be balanced on either of them. If this device fails, support the dolls with a fine piece of thread, similar in color to the background.

Where a title is to be inserted, allow four frames of film with no movement. In one of these frames insert a card with the word title and the number of the title on it. This will guide you in editing, later.

If you wish, you can produce train and motor car wrecks in miniature. Or you can have a first-rate "traffic jam" for a couple of dollars.

Here is a suggestion for a film in which inanimate objects become animated. Place a number of miniature trucks so that the camera cannot see into the body. Then proceed to discharge from it a load that normally would take ten or fifteen trucks to carry. It is a variation of the old slap-stick act in which ten or fifteen people get out of a small car. The truck could contain cases marked "Scotch," in reality little blocks of wood with pencil lines marking the cracks between boards and the lettering done in India ink. When thirty or forty of these cases have left the truck, sliding down a board to the ground and

off to one side out of the picture, have a few caskets climb into the truck and then roll the truck out of the scene. Only about five of the boxes would be needed, as they could be used over and over again. First let the end of a box show beyond the edge of the body of the truck; then move it a little at a time until it is in a full view and sliding down the board. Then introduce a second box in the same way, all he time moving the first box down the board.

The ideals which will present themselves to you as you become experienced in stop-motion," as this kind of work is called, are literally innumerable. And the results will delight the entire family.

APOLOGY

We inadvertently failed to mention that the frontispiece illustration in the February issue was a product of EWING GALLOWAY.

Here's the Second Step In Glider Construction

(*Continued from page* 1041)

can be marked for the elevator hinges to mesh with their mates on the stabilizer.

In assembling light framework of this kind it is well to remember that the nailing is not as important as the gluing. The nails simply hold the joints in position and the glue gives the permanent strength. Have plenty of fresh *casine glue* ready and coat each joint liberally. Do not wipe away any excess glue that may squeeze out of a joint.

Building the Tail Section

THE *tail section* is next built. This is a light framework of spruce strips fastened together with plywood gusset plates and its function is to hold the rudder, stabilizer and elevators, in their proper place back of the wings. Notice that all strips that slide lengthwise in the direction of flight are left square, and all strips that slide sidewise in the direction of flight are streamlined. To streamline a strip you simply round over its leading edge bluntly and plane down its trailing edge to a knife-like appearance. The blunt leading edge can occupy one-third of its width and the knife-like trailing edge can occupy the remaining two-thirds of its width. See the cross-section drawing of a streamline. All the strips for the tail section are cut from 1⅛" x 1⅛" spruce to the various lengths shown in the drawing of the tail section. The short upright strip at the front of the largest plywood side is rounded bluntly on its leading edge. The diagonal brace strip running from the bottom of this largest plywood side to the longest upright in front is fully streamlined. The longest upright strip in front is also fully streamlined. Lay all the strips on a level floor and shape each joint to fit evenly.

Using plenty of glue, attach the small triangular plywood gusset plates at each end of the longest upright strip in front; nail these into place. Next glue and nail one side of the largest plywood sides to the rear of the *tail section*. A 5" x ¼" machine bolt is next secured through the top strip at the rear as shown in the drawing. This is to be used in attaching the stabilizer later. A 1-1/16" thick spruce block is drilled and slipped over this bolt on the top of the top strip. Stand the tail section upright. By placing the stabilizer framework in position on this

(*Continued on page* 1045)

THE TELEPHONE BRINGS THE ADVANTAGES THAT COMFORT AND CONVENIENCE GIVE TO LIVING

This is the telephone's mission

An Advertisement of the American Telephone and Telegraph Company

IN THIS COUNTRY, a new type of civilization is being reared—a civilization of better opportunity for the average man, comfort and convenience, business enterprise and higher standards that enrich the daily life of all the people.

To build for this new age, the Bell System in 1929 expended more than 550 million dollars. These millions were used to add new plant and further improve service. Hundreds of new buildings, millions of miles of wire, chiefly in cable, eight hundred thousand new telephones—these were some of the items in the year's program of construction. At the same time, better records were made for speed and accuracy in service. This American development of instantaneous communication, of fast, far-reaching speech, belongs not to the few, but to the many.

It is the aim of the Bell System to permit each personality to express itself without regard to distance.

This is part of the telephone ideal that anyone, anywhere, shall be able to talk quickly and at reasonable cost with anyone, anywhere else. There is no standing still in the Bell System.

AMERICAN TELEPHONE & TELEGRAPH CO. BELL SYSTEM AND ASSOCIATED COMPANIES

Magnified 225 Diameters

This is what the tip of a fly's leg is like when seen through the Ultralens Microscope

At last a high powered microscope is within the means of all who wish to study, observe and experiment with the vast world of minute objects invisible to the naked eye. Such fun it is, as well as educational. No technical training required, yet hundreds of scientists and teachers are using this instrument. Gives enormous magnification and perfect definition. Send $5.00 for complete outfit. Send for descriptive literature.

$5.00 for Complete Outfit Prepaid

ROAT & LOHMAN, Dept.203, Milton, Pennsylvania

Build This Model Airplane YOURSELF

EXACT REPLICA 3-ft. model

BELLANCA *"Columbia"*

FULL SIZE PLAN WITH INSTRUCTIONS Complete Materials for Assembly. Guaranteed to Fly.

Send for your copy of our 56-page booklet describing 21 flying models and complete line of parts for model builders.

This booklet is mailed to you upon receipt of 10c.

Your dealer can supply you, if not order direct.

U. S. MODEL AIRCRAFT CORP.
397 Bridge St. Dept. A Brooklyn, N. Y.

Win $3,500.00

Many persons won from $1800.00 to $4245.00 each in our last offers by our unique advertising plan. A boy only fifteen years old won $900.00. A man between sixty and seventy years old, unable to get work, with doctor and household bills to pay, won $4245.00. A woman was surprised to win $2500.00. Every age or sex has an equal chance to WIN. In next three or four months we will award thousands of dollars to fortunate men and women who solve our puzzles and win our prizes. Here's our latest one:

Find the Twin Flyers

Here are sixteen pictures of a famous woman flyer. Now look closely. Don't make a mistake. All these pictures look alike, but they are not. Two, and only two, are exactly alike. **They are the twin flyers!** Can you find the two pictures that are alike in every way? Some are different in the collar, helmet, goggles, or tie. Each one is different from the rest except two. That's the challenge to you. Find them. Just send the numbers of the twin flyers on a post-card or letter today. If your answer is correct you will be qualified for this opportunity.

$7160.00 In Prizes Given In This One Offer

Over 25 prizes this time, and duplicate prizes paid in case of ties. A wonderful prize list to fit almost every human desire. We have arranged so that if the winner chooses he or she can have either $2875.00 in cash or a big new 90 H. P. Waco airplane with actual flying instruction. This prize will buy a home, an automobile. It's well worth while to try for. ANYONE WHO ANSWERS THIS PUZZLE CORRECTLY MAY RECEIVE PRIZES OR CASH.

Additional $625.00 for Promptness

Act quick. Be prompt. It pays. If you solve this puzzle correctly, I will send Certificate which will be good for $625.00 if you are prompt and win first prize, making your first prize $3500.00.

NO MORE PUZZLES TO SOLVE. Any man, woman, boy or girl in the U. S. A.—it doesn't matter who or what you are or where you live—except residents of Chicago, Illinois, and former major prize winners. 25 of the people who take up this offer are going to win these wonderful prizes. Be one of them. Just send the numbers of the twin flyers. Send no money, but be prompt!

J. D. SNYDER, Publicity Director, Dept. 160
54 West Illinois St. Chicago, Ill.

Boys! Make Big Money

Build Bird Houses

Here's a real money maker. With my simple instructions any boy can build and erect Grandpa Bird Houses. They sell at $2 to $97.50 each. $2,000 worth sold in Oak Park, Ill., in a year. Send $1 for my big collection of work shop plans for boys who want to have fun and make money building my famous bird houses. Valuable information about song birds and tips and advice on making sales included Free.

George J. Breidert, 1035 N Elmwood Ave., Oak Park, Ill.

SELL ROSECLIFF SHIRTS

Make Steady Money

Showing Samples Men's Shirts Ties, Underwear brings you big cash commissions. One Year Guarantee. No substitutions. Free silk initials. More exclusive Rosecliff features establish leadership. Write for your FREE Outfit NOW!

YOUR OWN SHIRTS and TIES

ROSECLIFF SHIRT CORP.
Dept. X-3
1237 Broadway, N. Y.

Outfit Free

A BIGGER JOB—*and you're the man*

Are you hunting a bigger job, or does the bigger job hunt you? Why waste years learning through routine work, when you can acquire at home in a comparatively few months the specialized knowledge which brings promotion and salary increase? Thousands of men have increased their incomes by home-study business training under the LaSalle Problem Method. Let us show you how you can do just as well or better. The coupon will bring you complete information, together with details of our *convenient payment plan;* also your free copy of a remarkable book—"Ten Years' Promotion in One." Make your start toward that bigger job *today.*

Find Yourself Through LaSalle!

LASALLE EXTENSION UNIVERSITY, Dept. 394-R, CHICAGO

The World's Largest Business Training Institution

Tell me about your *salary-increasing plan* for my advancement in the business field checked. Send also copy of "Ten Years' Promotion in One," all without obligation.

- ☐ Business Management
- ☐ Modern Salesmanship
- ☐ Higher Accountancy
- ☐ Traffic Management
- ☐ Railway Station Management
- ☐ Law: Degree of LL.B.
- ☐ Commercial Law
- ☐ Industrial Management
- ☐ Banking and Finance
- ☐ Modern Business Correspondence
- ☐ Modern Foremanship
- ☐ Personnel Management
- ☐ Expert Bookkeeping
- ☐ Paper Salesman's Training
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ Stenotypy—Stenography
- ☐ Telegraphy
- ☐ Credit and Collection Correspondence
- ☐ C. P. A. Coaching
- ☐ Railway Accounting

Name .....

Present Position ..... Address .....

Sound Detection Is Job For Real Sleuth

By Walter Raleigh

(*Continued from page* 1015)

hammer before the next beat, so rapidly that only the ear or the sense of touch could detect it.

As long as the Derby hat was kept away from the vibrating rod, the only sound produced was a barely preceptible hum. When the crown of the Derby was held against the end of the pole farthest from the oscillator, however, the rod emitted a loud, musical sound.

The explanation is that the Derby hat acted as a diaphragm. The end of the rod was too small to disturb the air sufficiently for the ear to catch the sound, but once the rod was placed against the hat, the volume of vibration increased to the point where it became audible. The same test with a human skull produced even more pronounced results of a similar nature.

Another Norris experiment had to do with two sheet-metal ventilating pipes. One was outlined with balsam wool held to the inner surface of the tube by a punctured metal sheet. The other tube was unlined. A small phonograph was set going and slowly inserted at the mouth of the unlined pipe. There was no noticeable effect upon the intensity of the sound. But when the phonograph was pulled into the lined pipe, the sound gradually faded. All but one and one-half per cent of the volume was absorbed by the lining.

A third way in which sound travels that would be difficult to trace is by reflection. Sound may go in a circle, as light goes in a circle when reflected by mirrors.

To solve this problem of sound tracing and measuring, Dr. C. A. Andree of the C. F. Burgess Laboratories has brought out his acoustimeter. This device measures the intensity of sound and in conjunction with the oscillator furnishes accurate results for a study of room acoustics. The oscillator emits a given note, varying in frequency from 500 to 525 cycles. This note is cut off automatically at regular intervals. At the same time the acoustimeter cuts in for the same period. As the sound dies out, the acoustimeter (or electric ear) measures its intensity area.

Sound and talking films have further increased the need of a thorough knowledge of the way sounds act. If the sound wave to the ceiling traverses a much greater distance than the wave that goes direct to the audience, confusion may result.

On a model which represented a cross-section of an auditorium, Dr. Norris demonstrated with a beam of light how echoes can be controlled. When the ceiling of the hall was curved to a certain degree, a light coming from the speaker's platform was reflected from the ceiling to the middle seats of the orchestra pit. Had it been a sound wave instead of a light wave, a disagreeable echo would have resulted, since the distance traversed was much greater. By flattening out the curved surface of the ceiling the wave was reflected to the rear seats of the balcony where it would be of benefit to the audience.

We are living in the world's noisiest age. Reform is in order. Yet it seems almost impossible to devise an easy, simple and scientific method of enforcing anti-noise laws or eliminating noise. The one way to keep noise out of a room and make it quiet seems to be: line it completely with padded hairfelt. Then (because of leakage) put on ear-muffs!

Here's the Second Step in Glider Construction

(*Continued from page* 1043)

top strip so that the back surface of the stabilizer spar is about ½" from the end of the tail section a hole position can be marked for the 5" long bolt to pass through the stabilizer center rib at its rear. Another ¼" hole can now be drilled through the top strip of the tail section and the center rib of the stabilizer at its front. Effort should be made to have these holes pass through the blocks between the battens of the stabilizer center rib as this will render the stabilizer attachment very strong. See hole positions in center rib of stabilizer drawing. The rudder is next held in position against the end of the tail section. See that the rudder has enough clearance to work over the stabilizer and mark the position for the rudder hinges, which are now mounted in the upright at the end of the tail section. The rudder and stabilizer are removed and the other plywood side is glued and nailed to the rear end of the tail section. Two metal fittings F. 4, are bolted, with a ¼" machine bolt, on each side at the bottom front of the plywood sides. This bolt must pass through the 1⅛" bottom strip, as shown in the tail section drawing. Two F. 4 fittings are placed in the top 1⅛" strip near the center of the plywood sides. Two more F. 4. fittings are placed against the top triangular plywood gusset plates at the long upright position in the center of the tail section.

Make eight dismount clamps F. 14, out of No. 10 carbon steel. Two of these are bolted, one on each side of the bottom 1⅛" square strip end. Two more F. 14 metal fittings are bolted, one on each side, of the top 1⅛" square strip end. Mount these F. 14, metal fittings, so that the ½" hole in its end does not project beyond the end of the 1½" square strips. The ½" hole drilled through the wood, in order that the ½" machine bolt, used for mounting at this point, will pass through both metal fittings and the wooden strip.

Details of Main Skid Section

THE main skid section is next to be built. It is best to make the four types of metal fittings, necessary for this section, at this time. The pilon clamp F. 10 is cut from No. 12 carbon steel and bent as shown in the drawing. This fitting holds the ends of the top flying wires which support the wings and should be

(*Continued on page* 1046)

Type Like Lightning 300 Words a Minute

By Mary Jacobs

(*Continued from page* 1001)

and print the word *sacrifice*. Just as on the regular typewriter, we depress the S key of the automatic keyboard. *Sacrifice* is the first word of the top left column of the square S. Therefore, we will next depress the corresponding first key of the first left section of "blind" keys. Instantly the word *sacrifice* appears—spelled correctly, printed and spaced. We have used 2 operations in place of the 7 for typing the letters on the regular typewriter, and eliminated one for spacing!

Words in the middle column of the square, such as *several*, make use of the middle section "blind" keys, for those in the right column, the right section "blind" keys are depressed.

Fellows I've Trained Will Tell You That You Too Can Make Good In ELECTRICITY

Get Into ELECTRICITY My Amazingly Easy Way

By Actual Work—in the Great Coyne Shops

I've put thousands of fellows in the electrical game, who are now making big money with no worries about the future. These fellows will tell you that you too can do what they did.

NOLAN H. McCLEARY
Chicago District Manager
Beardsley-Wolcott Co.

Nolan H. McCleary one of my graduates will tell you that you can get into electricity just as he did. He came here to Chicago from a little town in Kentucky, spent 12 weeks in my great shops and was trained on real, actual electrical machinery. Then my employment department placed him in a big pay electrical job.

Leland Hinds got a fine job at Cedar Grove, Indiana one week after graduation. Paul Hamilton stepped into the Electrical Department of a big concern at Knoxville, Tennessee three days after he left school.

If you want to get ahead just fill in the coupon below and mail it to me. Then I'll send you my big book and the stories of hundreds of fellows I've put on the road to big pay.

You Don't Need Advanced Education or Experience

You don't need advanced education or one day's electrical experience to master my course. All I ask of a fellow is the desire and ambition to make something of himself.

COYNE ELECTRICAL SCHOOL
H. C. Lewis, Pres. Est. 1899
500 S. Paulina Street, Dept. 30-27, Chicago, Ill.

I DON'T TEACH *by Correspondence*

No sir! I train you **right here in the great Coyne Shops**—on a gigantic outlay of electrical machinery—on real Dynamos, Engines, Power Plants, Switchboards, Transmitting Stations, Etc.—Everything from door bells to power house.

No Books-No Lessons

No books or lessons or baffling charts—all real actual work—that's a glimpse of how we train you to be a practical expert.

GET THE FACTS

Coyne is your one great chance for success. This school is 30 years old—Coyne training is tested—proven beyond all doubt. You can find out everything absolutely Free. Just fill in and mail coupon. Then I'll send you my big Free book of facts—jobs—salaries. Tells you also how many earn expenses while learning. Just mail coupon.

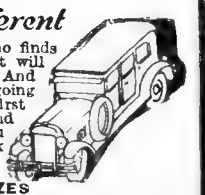
H. C. LEWIS, President
COYNE ELECTRICAL SCHOOL, Dept. 30-27
500 S. Paulina Street, Chicago, Ill.

Dear Mr. Lewis:
Without obligation send me your big free catalog and all details of Railroad Fare to Chicago, Free Employment Service, Radio, Aviation Electricity, and Automotive Courses, and how I can "earn while learning."

Name.....
Address.....
City..... *State*.....

$3100.00 IN PRIZES!! HUDSON 6 1ST PRIZE

Find the Dollar Sign that is different



Because it will mean money to you. Every person who finds the different Dollar Sign ($) and takes an active part will absolutely receive a handsome reward. You can't lose. And besides, some one who mails in this announcement is going to receive a LATEST MODEL HUDSON COACH, first prize. One of the Dollar Signs is different. Mark it and send this ad to me at once. If your eyes are sharp you may be the first to solve the puzzle correctly. Look closely—examine each $—they are all alike but one. Rush your answer with your name and address.

217 OTHER WONDERFUL PRIZES

Besides this luxurious Hudson we are going to give Absolutely Free 217 other prizes! Don't delay a minute. **THIS IS NOT A MAGAZINE CONTEST!**

$675.00 Extra for Promptness

Everyone answering this advertisement will receive a valuable award

Win the Hudson and I will give you $675.00 Cash Extra if you're prompt. Every prize guaranteed and will be paid promptly. Think what it means if you win!

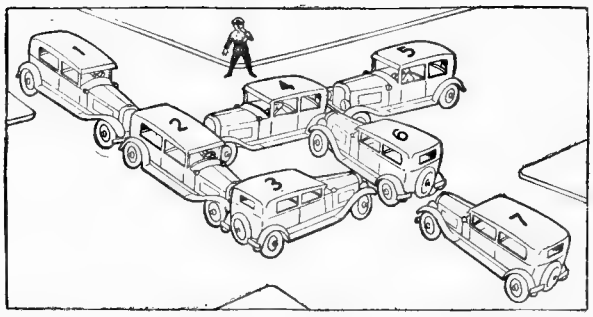
Name .....
Address..... Town.....
BEAUVILLE CO., Dept. A-41, 700 East Sixth Ave., Des Moines, Iowa

Win Nash Sedan and $500 or $1,845 Cash

Seven Brand New 6-Cylinder Cars Given

For advertising purposes I am going to give absolutely free a brand new six-cylinder "Special Six" Nash four-door Sedan, an Oldsmobile two-door Sedan, a De Soto two-door Sedan, a Pontiac two-door Sedan, an Essex two-door Sedan, a Whippet two-door Sedan, and a Chevrolet two-door Sedan, all six-cylinder latest model Sedans; also 4 splendid new console type radios, a Victor Orthophonic Victrola and other valuable prizes. Any person living in the United States outside of Chicago may enter an answer to this puzzle except employees of the W. D. Boyce Company or members of their families, or winners of automobiles or first prizes in any of our previous offers, or members of their families.

SOLVE THIS TRAFFIC PUZZLE



In the picture there are 7 cars in a bad traffic jam. None of them can move forward, for each car is blocked by the one in front of it. One of these cars will have to be backed out. Which one? The traffic policeman seems to be stumped. Can you straighten up this tangle for him? Only one car may be moved backward, and if you pick out the right one, you will see that it is not necessary to back up any of the others. Send the number of the car which when backed out will relieve this traffic tie-up, and if your answer is correct you will be qualified for this opportunity.

$500.00 for Promptness

We are not only giving the Sedans, radios and so forth in our big prize list amounting to over $6,800.00, but are also giving an additional $500.00 in cash for promptness to the winner of first prize if he or she has been prompt. Thus, the first prize winner will receive the Nash Sedan and $500.00 in cash, or $1,845.00. Find the car which when backed out will relieve this traffic tangle and send the number of it in a letter or on a post card, or you can mark the car on the picture and send it to me. Be sure to write or print your name and address plainly. All who answer correctly can share in the prizes or cash. ANSWER TODAY. In case of a tie for any prize duplicate prizes will be paid.

G. W. ALDERTON Dept. 293, 510 N. Dearborn St., Chicago, Ill.

Learn **Advertising at HOME**

Send your name and address for free booklet giving interesting information and vital facts about Advertising. Find out how we prepare you at home, in your spare time, for the opportunities open in this fascinating business. Practical work. No text books. Old established school. Successful graduates everywhere. Just the plan you have always wanted. Write today. No obligation.

PAGE-DAVIS SCHOOL OF ADVERTISING
Dept. 1423, 3601 Michigan Ave., Chicago, U. S. A.

Wrestling Book FREE

Learn to be an expert wrestler. Know scientific wrestling, self-defense and Jiu-Jitsu. Develop a splendid physique, and have perfect health. Join this popular school and learn by mail. The famous world's champions—the marvelous

Frank Gotch and Farmer Burns

offer you a wonderful opportunity. Wrestling is easily and quickly learned at home by mail. Men and boys write now for splendid free book. Learn all the science and tricks. Be able to handle big men with ease. Accept this wonderful offer NOW. Send for free book today, stating your age.

WRESTLING FOR HEALTH

Farmer Burns School of Wrestling, 3793 Range Bldg., Omaha, Nebr.

$80 to $150 A WEEK

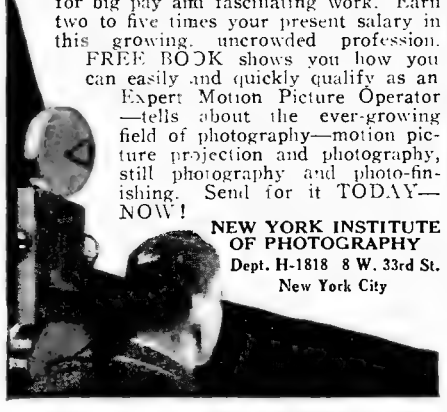
MOTION PICTURE OPERATORS EARN THIS—and MORE

Big Pay—Easy Work—Short Hours

YOU can quickly qualify for one of these well-paying positions. Big demand now for motion picture projectionists—in theatres, schools, industrial motion pictures or for spare-time entertainments!

Our complete home study course teaches you everything—qualifies you in short time for big pay and fascinating work. Earn two to five times your present salary in this growing, uncrowded profession.

FREE BOOK shows you how you can easily and quickly qualify as an Expert Motion Picture Operator—tells about the ever-growing field of photography—motion picture projection and photography, still photography and photo-finishing. Send for it TODAY—NOW!



NEW YORK INSTITUTE OF PHOTOGRAPHY
Dept. H-1818 8 W. 33rd St.
New York City

Where Will You Get in 1930?

A whole new year full of opportunities is waiting for you. Now is the time to decide. If you want to get ahead—get in the **BIG PAY Class!**

HERE'S YOUR OPPORTUNITY

Learn **ELECTRICITY** this amazing new way! Motion Pictures train you quicker, better. Right in your home, movies make every point clear. Simple, fascinating instruction teaches you thoroughly, easily.

Genuine DeVry motion picture projector at no extra cost. Thousands of feet of film furnished.

$60.00 to $150.00 Weekly

We pledge to give you the training and employment service necessary to secure a better job at bigger pay or refund money. Get full facts. No obligation. Write quick while offer lasts.

MAIL this Coupon

National School of Visual Education, Dept. 3-BN
537 S. Dearborn St., Chicago, Ill.

Send book, "The Film Way to Bigger Pay" with facts about this new way to master ELECTRICITY.

Name_____ Age_____

Street or R.F.D._____

City_____

State_____

Here's the Second Step in Glider Construction

(*Continued from page* 1045)

bent with care. Two F. 4. metal straps are riveted, one on each side into each of the ¼" holes in the center section of this fitting. The drilled copper rivets which form bushings in the free ends of each F. 4 strap gives a soft bearing to the flying wires which pass through each pair of F. 4 fittings at these four attachment points. Two front flying wire clamps are cut and bent as shown in the drawing F. 8. These are made of No. 10 carbon steel and a pair of F. 4 metal straps are riveted, one on each side, into each of the ¼" holes in the top bent section of the fittings. These F. 8 metal fittings hold the ends of the bottom flying wires, which connect to the under-surface of the wings. Two rear flying wire clamps are cut and bent as shown in the drawing F. 11. A pair of F. 4 straps are riveted in the ¼" hole at the pointed end of these F. 11 fittings. Four spar brackets F. 5 are cut and bent as shown in the drawing. The ¼" machine bolts which hold these fittings pass clear through the woodwork of the main skid section when they are mounted later. The runner or skid is formed by bending to shape the bottom 1¼" x 1¼" square spruce strip, as shown in the main skid section drawing. This may be accomplished by steaming or by cutting this strip somewhat thicker at its front third, and sawing slots lengthwise through the thicker part. By inserting a quantity of glue into these slots and allowing this to dry while the strip is held in shape, a very strong bottom strip can be formed. Cut and shape all the upright and diagonal struts and streamline the ones specified in the main skid section drawing.

Lay all the timber members on a level floor and mark their ends to cut so that they will assemble as shown in the drawing. The tail section framework can be held in place to help this adjustment for assembly. The long top strip of the tail section should be in line with the cross member at the bottom of the top plywood side of the main skid section. Next cut and shape the two top plywood sides and the two plywood sides of the runner. If it is found necessary to piece the plywood sides of the runner it is best to reinforce such joints, on their inside surface, with ¼" x 1" wood strips. Using plenty of glue and nails fasten both top plywood sides in place and in like manner fasten one of the plywood runner sides in position. Drill and insert the ½"x3" machine bolt in the top 1¼" x 1¼" strip at the nose of the runner. This bolt should have a tight drive fit as it is to support the rudder bar later. The remaining plywood side of the runner can now be glued and nailed into place. All the woodwork of the main skid section can now be smoothed up with sandpaper. It is well to sand the main tail section framework at this time also.

Apply a coat of spar varnish to both tail section and main skid section. When the first coat of varnish is dry sand lightly and apply a second coat. Ash clamps about ¾" x 2¾" are next bolted to each side of the runner with ¼" machine bolts which run clear through the runner. These bolts should be inserted so as to run through the 1¼" square strips in the top and bottom of the runner and also through the 1¼" x 2¾" main upright strut. Place these bolts about four inches apart along the length of the ash clamps. Some builders glue these ash clamps in place and do the bolting before the varnish is put on. The ash runner is next cut to shape and

Here's the Second Step in Glider Construction

(*Continued from page* 1046)

screwed onto the bottom of the runner. The heads of the screws should be countersunk in the ash runner and the whole bottom surface sanded very smooth. The metal fittings are next bolted to the main skid section. Use the F. 14 fittings on the tail section to determine the exact position for their F. 14 mates on the main skid section. Use the F. 25 fittings on the ends of the wing spars to determine the exact position for the F. 5 fittings on the main skid section. A line extended along the 1⅛" top strip of the tail section should continue on through the top bolt hole of the front and back F. 5 spar bracket fittings. The glider will control easier if these two F. 5 fittings line up with the top of the tail section.

Construction data are now given for building the wings, rudder elevator-stabilizer(tail section, and main skid section. In the next instalment the wiring, and control system will be explained. Those who may be constructing this glider from data as set forth in these articles will see, upon completion of the work described in this issue, that the machine is rapidly forming into shape. They probably will experience much anxiety to get the little ship together and into the air. This anxiety must be suppressed at this time. The other parts, which are to be explained later in this magazine, are of important size and balance requirements. They must be constructed with accuracy of detail in order that the home glider builder may reap the maximum reward for his effort and time.

In Amazing Stories for March

THE GREEN GIRL, by Jack Williamson (A serial in 2 parts), Part 1.— This well-known author comes to us now with a truly unique story in which much time is spent in a spectacular migration to a strange land beneath the waters of the Pacific. Start the first instalment in this issue.

THE SHIP THAT TURNS ASIDE, by G. Peyton Wertenbaker. We are glad to be ale to give our readers another story by the author of "The Chamber of Life," so soon after the other. This author ahs been well known as a writer of unusual scientific fiction for a long time now. In delving into the bizarre tales of travelers in unknown space and into the 4th dimension, he seems to be better than ever.

LANTERNS OF GOD, by Robert A. Wait, who is not only a scientist of note, but a writer of extremely good scientific fiction as well. "Lanterns of God," is a fascinating astronomical fantasy, dealing with the troubles of the earth from cosmic and interplanetary forces.

CALLISTO AT WAR, by Harl Vincent. Here is the promised sequel to "Explorers of Callisto," which appears in the February issue, and in which Mr. Vincent—in his best style—continues the adventures of the Tellurians and Lola the moon woman. There may be much of interest on the other side of the moon. Who knows?

And other Stories.

Draftsman's Pocket Rule
GIVEN TO YOU
See Money-Making Tools Below
FREE
If you are 16 or older and will copy Jack shown at right and mail it to me I will send you a Draftsman's pocket rule, free.
Just Copy This Jack Today!
NEW Pay-Raising Plan
My Pay-Raising Plan Engineer Dobe
Copy me and get Lawrence Rule Free.—Jack

Write to me. I will send you this new book. Not a catalog. My Pay-Raising Plan and Money Making Advice. I can prove that John Savadge, trained by me, makes $300 a month. Earl J. Dupree, trained by me, refused $600 a month because he makes more in his own business. A. H. Bernier, trained by me, earns $7000 to $9000 a year. Arthur Dewalt, trained by me, makes more than $400 a month. D. C. Stroop, trained by me, makes $475 a month. L. V. Broughten, trained by me, makes $300 a month.

Now is the time to learn to be a draftsman, Get Free, "My Pay-Raising Plan" Send for it at once. Let me tell you how some Dobe Draftsmen make $250.00 to $750 a month. Read this advert sement clear through. See for yourself how you can make real money as a draftsman. Read how much work there is for them.

Age or Lack of Education No Drawback

You do not need previous experience. You do not need to be a high school graduate. My practical. home study course gives you just the kind of training you need to become successful, during only your spare time.

I Train You at Home

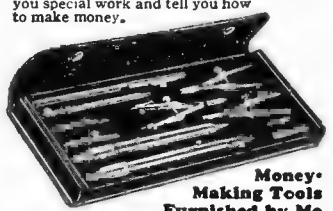
My practical working method makes every step in learning drafting as clear as a moving picture. That's why I train you so fast to be a draftsman.

Money Back if Not Satisfied

I train you under a positive Money Back Agreement. If my training does not satisfy you after you have finished you get every penny back.

Earn While You Learn

You can start earning extra money a few weeks after beginning my training. I give you special work and tell you how to make money.



Money-Making Tools Furnished by Me

You get these fine quality, genuine, imported draftsman's tools, just as soon as you become my student No finer tools made for practical drafting work.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of draftsmen come to me for men because they know that men I train make good.

Draftsmen Needed In Auto Work

The automobile industry is one of the greatest in America Thousands of draftsmen needed. I'll train you for the work.

Electricity

Electricity is the coming motive force of the world. Draftsmen are needed in every department of this fascinating work I'll train you at home. Get a job here

Aviation

Aviation is just in its infancy It's bound to expand to enormous proportions. Draftsmen are essential to it. I'll train you quick at home for drafting position

MotorBusWork

Motor bus building and motor bus transportation have become leading world industries Hundreds of draftsmen engaged in this work. I'll show you the way

Building Work

There will always be building No structure can be erected without plans drawn by draftsmen. I'll make you an architectural draftsman at home.

"If You Earn Less Than $70 a Week Write Me Today! I Will Train You At Home" Engineer Dobe

ACT NOW Before You Put this Magazine Down, Let me send you my books "Successful Draftsmanship" and "My Pay Raising Plan". Remember Draftsmen are needed everywhere. That's the kind of profession to get into. Get started now. Get into a better position, paying a good straight salary the year around.

Engineer Dobe 1951 Lawrence Avenue Div 14-23 Chicago, Ill.

Mail Sketch—Get Free Rule

ENGINEER DOBE
1951 Lawrence Ave., Div. 14-23 Chicago

Here's the sketch. Send me free rule; also send me free of all cost books "Successful Draftsmanship" and "My Pay-Raising Plan,"—how to earn money while learning and proof of big money paying positions.

Name..... Age.....

Address.....

Post Office..... State.....

TYPEWRITER ½ Price

World's best makes—Underwood, Remington, Royal—also portables—prices smashed to below half. (Easy terms.)

SEND NO MONEY!

All late models completely rebuilt and refinished brand new. *Guaranteed* for ten years. **Send no money**—big *Free* catalog shows actual machines in full colors. Get our direct-to-you easy payment plan and 10 day free trial offer Amazing values—send at once.

Free Trial

International Typewriter Exch., 231 W. Monroe St. Dept. 321, Chicago

QUIT TOBACCO

Don't try to banish unaided the hold tobacco has upon you. Thousands of inveterate tobacco users have, with the aid of the Keeley Treatment, found it easy to quit.

KEELEY TREATMENT FOR TOBACCO HABIT Quickly banishes craving for tobacco. Successful for over 50 years. Write today for FREE BOOK and particulars of our MONEY-BACK GUARANTEE.

THE KEELEY INSTITUTE, Dept. L-601, Dwight, Ill.

Home of the famous Keeley Treatment for Liquor and Drugs. Booklet Sent on Request. Correspondence Strictly Confidential.

new MONEY MAKING OPPORTUNITIES Write!

Make Big Money! Finest Work pants, breeches, coveralls; 1 for $1.95, 3 for $5.50; you make $1.00. Sales outfit Free. Write today, Dept. P3, Longwear, 489 Broome St., New York City.

An opportunity to get brand new Ford Sedan absolutely Free, besides biggest commissions, taking orders for our fine all-wool, union-made, tailored-to-order suits at $23.50 and up. Handsome outfit of large cloth samples furnished Free. Spencer Mead Co., Harrison & Throop Sts., Dpt Q-972, Chicago.

Jas. Bell, Haddonfield, N. J., sold 137 in one day. J. Monsa, Chicago, averaged 60 daily for 2 weeks. G. Birnbaum aver. 65. New product backed by new idea. Sells on sight. 10,350 sold in 6 months by Fuller. Write today. Steral Mfg Co., 72 So. St Clair, Toledo, O

Ladies' Big Money. Show complete wardrobe boys, girls. Also women's house dresses, 3 for $4.95. Satisfaction guar. Style book Free. Write Dept. G3 Bobby & Jane, 303 Fourth Ave., N. Y.

We Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 670, St. Louis, Mo.

A Paying Position Open to Repr. of character. Take orders Shoes-Hosiery direct to wearer. Good Income. Permanent. Book "Getting Ahead" Free. Tanners Shoe Mfg. Co , 2143 C St., Boston.

Big Money Daily. Selling Shirts, Neckwear, Underwear, Pajamas, Sox, Sweaters, Raincoats, Pants, Overalls, Playsuits. Outfit Free. Nimrod Co., Dept. 85, 4922-28 Lincoln Av , Chicago.

If You Want to Make $100, $500 or $1,000, just send me your name. Wonderful new proposition. No capital needed. Particulars free. Albert Mills, 5016 Monmouth, Cincinnati, Ohio.

$5.00 Every Time You Sell My Tailored-to-Order $35.00 value all-wool suit for $23.50. If you want to try, write! Everything furnished free. P. A. Bobb, 2256 S. LaSalle, Chicago.

Sell Union-Made-to-measure. All-wool suits and overcoats at $25-$30-$35. Make $95 weekly. Biggest coms. paid daily. Extra bonus. Write for details. Nearly 200 pure-wool fabrics sent Free. Pioneer Tailoring Co , Congress & Throop Sts., Dept. Q-1272, Chicago.

Agents—Up to $72 weekly. Introducing hosiery guaranteed 6 months or replaced. 126 styles; colors for Men, Women, Children. Auto hose offered free. Outfit furnished. Wilknit Hosiery, Dept. C-235, Greenfield, Ohio.

Agts. earn big money taking orders beautiful Dress Goods, Silks, Wash Fabrics, Hosiery, Fancy Goods. 1000 samples furnished. National Importing Co , Dept. B-89, 573 Broadway, N. Y.

Opportunity to Make $100. Weekly selling all-wool, union made-to-measure suits and topcoats at $23 50 and up. Build big repeat business. Big pay daily; mthly bonus extra. Large swatch samples Free. W. Z. Gibson, Inc., 500 S. Throop St., Dept. Q-672, Chicago.

Everett Myers Made $161.66 in 1 Month In Spare Time

"I did more business this month than I did in a year filing saws by hand. I banked $161.66 which was accomplished in spare time and I can only attribute this new added success to my Foley because of its speed which enabled me to turn out four times more work."
—Everett Myers.

The Foley Model F-5 "3-Way" Automatic Saw Filer

Files all kinds of saws automatically so they cut better and stay sharp longer. Big demand for Foley-filed saws that pays *steady profits*. Start in spare time and build a permanent, fine-paying business.

Easy Payments

You can start in this profitable business with a small down payment and pay the rest out of profits in easy monthly payments. No stock to carry. Easy and simple to operate. Many men are making *big money*—why don't you?

Free Plan Helps You Start

Proved and tested plan tells you where to get the business. Many successful men have used it. You can make *big money*, too. Get started now—send for this *Free Plan* today.

Foley Manufacturing Co.
1447 Foley Bldg., 11 Main St. N. E., Minneapolis, Minn.

GOV'T POSITIONS
$35 TO $75 WEEKLY

MEN WOMEN — AGE 18 TO 55

( ) Railway Mail Clerk	( ) Meat Inspector
( ) P. O. Clerk	( ) Special Agent (Customs Insp.)
( ) P. O. Laborer	( ) Steno-Typist
( ) File Clerk	( ) Immigrant Insp.
( ) Matron	( ) City Mail Carrier
( ) General Clerk	( ) Border Patrol
( ) Chauffeur-Carrier	( ) Typist
( ) Skilled Laborer	( ) Seamstress
( ) Watchman	( ) Steno-Secretary
( ) Postmaster	( ) Auditor
( ) RFD Carrier	

INSTRUCTION BUREAU, 383 St. Louis, Mo.
Send me particulars about positions marked "X"—salaries, locations, opportunities, "How to Qualify" etc.
Name .....
Address .....

World's Wonder Wrench
Banishes Old Style Wrenches!

Pays Agents Big Money

New! Different! Never a nut wrench like "Speednut." Chicago Auto Show sensation. Automatic! Ratchets! Can't slip! The harder it's pulled, the tighter it grips! A whole kit of wrenches in one. Has 23 wonder features. Priced low with big profits to you. Enormous demand. Special Demonstrator Offer starts you writing orders from tool users, car owners, factories, shops, part, full time. Collect your pay daily. We deliver. SPEEDNUT CO., 190 N. State St., Dept. 76, Chicago.

FREE Wholesale Radio Catalog
Set Builders-Dealers! Save Money!
Send for the most complete book of nationally known Parts, Kits, Cabinets, Consoles, Speakers, Power Units, Sets, etc. All at lowest wholesale prices. Quick service on all your needs. Write now, it is FREE—
SHURE BROS. CO.
Dept. 328, 335 W. Madison St., CHICAGO, ILL.

How Many Minutes Make a Mile?

By Donald H. Menzel

(*Continued from page* 995)

inch and a quarter.

If, then, I set up my watch as standard for the universe, I can plot fifteen minutes of time as an inch and a quarter, and our picture will look like this.

On an alarm clock, fifteen minutes is a much greater distance—on a tower clock still greater—and so on.

There are many ways of expressing time in terms of space, and vice versa. The thirty minutes in your apt illustration represent the distance traversed by some individual between his home and Times Square.

Suppose we set out to choose a universal clock—what qualifications do you think the ideal timepiece should fulfill?

L.—The ideal clock should keep perfect time.

R.—Let's analyse that statement. What do you mean by keeping "perfect time?"

P.—According to our definition, this requires that the motion of the clock-hand be absolutely uniform—that its velocity be unaffected by temperature, pressure, gravity, motion, and other influences.

R.—Right! But what clock or watch does more than approach those ideal conditions? Even the rotating earth appears to be slowing. There is only one thing in the world I can think of that comes anywhere near our ideal—a clock made of light beams.

I strike a match. Its radiance spreads out into space at a speed of 186,000 miles a second. One of the *postulates* of relativity is that the velocity of light in a vacuum is always the same no matter how it is measured. Here, then, is an ideal clock. Place two mirrors facing each other across an interval of 186,000 miles. Now start a tiny flash of light winging its way back and forth, like a shuttle-cock, between them.

P.—Hold on a minute. I think that the rate of your clock would vary according as it is moving or is stationary in space. If it is moving, the light ray will have to chase after the mirror in order to be reflected, and the clock will run more slowly.

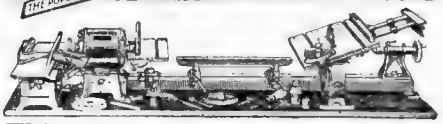
R.—You are forgetting that it is impossible for us to tell whether or not a given clock is stationary in space. Velocity has significance only when we are able to detect the surroundings of the object in motion. Empty space is not visible, hence it is impossible to measure the absolute velocity of anything. We have gone into this all before. The whole structure of relativity is reared upon this point.

P.—But clocks moving relatively to each other will run at different rates.

R.—That is true. You are, no doubt, about to suggest that we substitute some sort of ideal mechanical clock. Even that does not take us out of the woods, however. The speed of light still comes into the picture. In order to read the clock we must illuminate it, and the light from its face must enter our eye. To put it another way, you see the face of your watch, not as it is now, but as it was when the light left it. Light travels fast, but the transmission is not instantaneous. If the speed of light were one foot instead of 186,000 miles a second, the problem of allowing for the time of transmission would be a very practical one.

You note that the clock on the City Hall tower stands at six o'clock. If you are a very accurate person you may reflect that, since you are a mile away from the clock, it is actually 1/186,000th of a second

Mac WORKSHOP THE POPULAR MECHANIC **Electrically Operated**



This Complete *Mac* Workshop Now Sent on 10-Days Free Trial

Send now for details about this big, powerful, sturdy equipment. 36" lathe, 8" saw, 4" jointer, 1-3 Horse Power Motor, Jig Saw, and all units for a complete motorized workshop. Easy to operate. Shipped on approval, ready to plug into light socket. Plans and instructions furnished. Unusually low prices and convenient monthly terms. **GET DETAILS**

Midland Appliance Corporation
Dept. 1549 225 N. Michigan Avenue, Chicago
Please send details.

Name .....
Address .....

AN **EASIER Way to Popularity**

PLAY your way to favor with a sweet-toned, easy-playing Pan-American. You learn popular music quickly. Fun, popularity, increased income! Choose any instrument—Pan-Americans are the only complete line of nationally-advertised, factory guaranteed, moderately priced instruments made. ***Free Trial;*** write for literature; mention instrument.

PAN-AMERICAN
Band Instrument and Case Co.
305 Pan-American Bldg.
Elkhart, Ind.

BOYS! GET READY FOR NATIONAL MODEL PLANE CONTEST

GREAT FUN FOR EVENINGS

Big Cash prizes are won yearly by contestants. Send 10c today for 48-page illustrated catalog and contest particulars. Hurry—no time to lose.

MICHIGAN MODEL AIRPLANE SUPPLY CO.
4768-D Grand River Ave. Detroit, Mich.

DEAFNESS IS MISERY

Multitudes of persons with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they Use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

A. O. LEONARD, Inc., Suite 685, 70 5th Ave., New York

This BOOK 10¢

Amaze and Mystify Your Friends!
Earn money at Clubs and Parties. No skill required. It's easy. "The Book of 1000 Wonders" tells how and teaches you many startling tricks of Magic. Also contains a complete catalog. Send 10c. today.

LYLE DOUGLAS
Station A-3 Dallas, Texas

2.00 FREE 10 DAYS TRIAL
INKOGRAPH
PENCIL POINTED FOUNTAIN PEN

Writes with ink smooth as a lead pencil on cheapest or finest paper, without miss, skip or blur. Won't blot, scratch, leak or soil hands.
Makes 3 carbon copies at one time with original in ink. Anyone can use your Inkograph—hard pressure cannot spread or injure its 14Kt. gold point. Patent automatic feed prevents point from clogging. No complicated mechanism. Best materials and workmanship. Fully Guaranteed.
Send No Money. Pay postman $2.00 plus postage. Sent prepaid if remittance accompanies order. Money back if dissatisfied in 10 days.

THE WRITING HEMISPHERE
THAT BALL-LIKE 14 KT GOLD POINT

INKOGRAPH CO. Inc. 161-200 Centre St., New York City

AGENTS Send for Inkograph or FREE Sales plan booklet. Sells on sight—no investment—no competition.

later, adding the time it takes the light to reach your eye.

P.—I withdraw my objections. I see that no clock I could propose would serve any better than your light-ray clock. Furthermore, if our theories are to be in any sense universal, the universe must be our laboratory. Light rays are the only messengers we have that tell us what is occurring in the depths of space. A new star flashes in the sky. Actually the outburst may have occurred hundreds of years ago. The flash we see may well be called the tick of the clock that recorded the conflagration. In order to compute the actual date of the catastrophe, we must divide the distance of the star by the velocity of light. That tells us how long ago the flash occurred.

R.—It would, but for one thing. The *measured* velocity of light is always 186,000 miles a second. This is due to the fact that motion so affects our clocks and measuring rods that this answer is a foregone conclusion. But the effective speed of light may be anything. This is a point not always brought out. In our clock tower analogy, if there is anything like an "ether wind" arising from the joint motion of yourself and the tower, the light will be carried toward you in the same way that a high wind speeds the transmission of the sound of a church bell. Since no experiment we can perform can detect the existence of this ether wind "blowing" the light toward or away from you, you will be unable to calculate either the exact time of 6 o'clock on the city-hall tower or the moment that the star's flare occurred.

The unavoidable use of light as a means of transmitting signals completely justifies the type of clock I proposed. Our geometry is built out of cubic miles and light seconds. I shall not take your time, just now, to discuss this geometry in great detail—but let me assure you that the results are indeed weird and startling. One of them is the impossibility of locating, exactly, events in space. A second result is that time's rate of progress varies with motion. As you suspected, the faster a clock is moving, the slower its rate will be. A third we have discussed previously: *any moving object will appear to be contracted in the direction of its motion.*

Let us suppose that aviators, through some remarkable invention, will eventually be able to fly at 161,000 miles a second. If you examine his clocks as one of them speeds past, you will find that they *appear to be* running at about half-speed. Furthermore, his plane appears to have shrunk to half size along the axis of his motion. . .

This Discussion will be Continued in Our April Issue

SOLUTION TO PUZZLE ON PAGE 1032

■	B	A	L	L	O	O	N	T	I	R	E	■
H	E	X	■	A	N	■	A	U	■	A	R	C
I	D	I	O	T	■	C	■	R	I	D	E	R
L	■	O	■	S	I	R	E	N	■	I	■	A
L	A	M	P	■	R	U	T	■	C	O	I	N
C	I	■	E	A	■	D	■	U	L	■	O	K
L	■	U	N	I	V	E	R	S	A	L	■	S
I	T	■	N	R	■	O	■	A	M	■	R	H
M	A	N	Y	■	P	I	T	■	P	A	R	A
B	■	I	■	A	X	L	E	S	■	I	■	F
E	N	T	E	R	■	S	■	E	M	M	E	T
R	A	R	■	A	B	■	L	A	■	E	M	S
■	C	O	M	M	U	T	A	T	O	R	S	■

This Discovery For Men

Often Brings New Meaning to the Years that Follow 40!

Now...In Your Own Home You Can Use This Great Natural Drugless Prostate Gland Stimulation

THE long sought method of drugless Prostate gland stimulation has been found. Already it is used by more than 50,000 men—victims of prostate gland disorder—men past 40, men who have found themselves suddenly on the down grade. Quietly, this great discovery has almost overnight spread from coast to coast, from nation to nation. Absolutely harmless, including nothing of medicine, drugs, violet ray or quackery, this type of treatment has been accepted by many physicians and specialists.

A foremost sanitarium has advised this great discovery for home treatment.

This "treatment-discovery" is the work of a pioneer scientist in the field that has recently made discoveries recognized as important by medical science the world over. It can be used by any man in the privacy of his own home. Men 90 years old have used it successfully.

Are you aging too soon . . . getting up 5 to 10 times at night? Is strength ebbing . . . are you half-living . . . blue, depressed, subject to chronic fatigue, constipation, backache, foot and leg pains? Then you should know at once about the vital prostate gland, how it sometimes sends its warning to every part of the body, often slowing up mental as well as physical functions. Do not make the mistake of confusing your trouble with bladder or kidney ailments as so many thousands of men do if it is due to the prostate gland.

Users are telling how this method worked when all others had failed. Many say they were on the verge of a painful gland operation when relief was found at last. Others tell of beneficial results which seem almost miraculous. Thousands say they feel years younger.

So wonderful are the marvelous results this treatment often brings that it is sent to your home with the understanding that unless its benefits are positive and immediate—within 6 days—it costs you nothing.

Mail the coupon below for full details. An interesting illustrated book will be sent you free in plain wrapper. No obligation. But act now. It may mean the saving of years of painful and torturous condition.

W. J. KIRK, President
4527 Morris Ave., Steubenville, Ohio

If you live West of the Rockies, mail your inquiry to
The Electro Thermal Co.
303 Van Nuys Building, Dept. 45-D
LOS ANGELES, CALIFORNIA

W. J. KIRK, Pres.
4527 Morris Ave., Steubenville, O.

Please mail at once a FREE copy of the booklet, "Why Many Men Are Old at 40," and all details about the new treatment. I'm not obligated in any way.

Name .....

Address .....

City ..... State .....

Who Wants a Sedan FREE?

STUDEBAKER—BUICK—NASH! TAKE YOUR CHOICE!

or $2000.00 Cash

Thousands of dollars in new autos and grand prizes will positively be given free to advertise and make new friends for my firm. Choice of Studebaker or Buick or Nash new 4-door sedan delivered free, or $2000.00 cash. Also Oldsmobile, Pontiac, Chevrolet, Fords, diamonds, other fine prizes and cash will be given free. No problems to do. No fine writing required. No words to make. No figures to add. Bank guarantees all prizes.

PICK YOUR LUCKY STAR!

All the stars in the circle are exactly alike except one. That star is different to all the others and it may be a lucky star for you. Can you pick it out? If you can, mark the different star and send the circle to me at once along with your name and address. A prompt answer can start you on the way to win the great $2000.00 free prize.

BE PROMPT—WIN $650.00 EXTRA

Someone like you who will write me at once can get $650.00 cash just for being prompt, so you may thank your lucky stars if you send your answer right off. No risk. Nothing to buy. Nothing hard to do. Over $7000.00 in valuable prizes will be given free of cost. Send today and I will show you just how you can get your free choice of these splendid new sedans or $2000.00 cash, without cost or obligation of any kind. All win plan! A reward for everybody. SEND NO MONEY. Answer AT ONCE.

GEO WILSON, DEPT. 71, AUGUSTA, MAINE

Show windows of the world

MR. KIPLING to the contrary, East *does* meet West—in the advertising pages . . . British cutlery and Chinese porcelains. French furniture and Persian rugs. Marble from Italy and ivory from India. Coffee from Brazil and tea from Ceylon. . . . Products from every corner of the earth come to you in the advertisements. They are the show windows of the world.

Without leaving the arm-chair in your own living-room, you can pass from an Oriental bazaar to a breakfast food factory in Battle Creek—and back again. The journey is fraught with color and romance. You learn something of far-away lands and peoples—of periods and patterns. You begin to understand problems of craftsmanship and processes of manufacture.

And you learn *value*. You realize that products consistently advertised are the finest of their kind. When you go to buy, you know exactly what you want, how much it should cost, where to find it and what to ask for. . . . You save time and money by shopping in the world's show windows.

Advertisements are a practical and cultural part of the modern background . . . read them regularly.

NIGHTS OF JOY IN STORE FOR you!

Free Lessons!

START TO PLAY VERY FIRST DAY

Even if you can't read a note of music right now, you play a simple melody on the very day you get your Deagan Xylorimba. Free, easy lessons show you how. Soon you are amazing friends and relatives. Then a new life begins—long, happy evenings of joy; parties; popularity; radio engagements—and the same chance to make $5 to $25 a night as Ralph Smith, Chicago—"Played 20 minutes at wedding; received $20." Or the Hallmann family, Reading, Pa.,—"Made $300 in 5 weeks, spare time."

FIVE DAYS' FREE TRIAL—Our big FREE book tells all about this fascinating instrument—the 5-day free trial offer—the free lessons—the easy payment plan. Send in the coupon today—the booklet will be mailed promptly without cost or obligation.

MAIL COUPON TODAY!

J. C. Deagan, Inc., Dept. 1563, 1770 Berteau Ave., Chicago
Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xylorimba.

Name _____

Address _____

How Are Your Nerves?

I'll Make You Master of Them —Or No Cost!

By DAVID V. BUSH

DAVID V. BUSH

WEAK, run-down nerves cause more misery and unhappiness than any other human affliction. In their insidious wake they leave sickness, failure, worry and discouragement, lost youth and shattered health. Yet most cases of sickly nerves can now be ended—*easily*.

Are you a slave to your nerves? Do you fret about little things? Are you "blue" and melancholy? Do you suffer from indigestion, heart palpitation, dizzy spells? Do you worry about your job? Money? Your future? *Be careful!* These are Nature's warnings that unhealthy nerves are leaving you open to a complete mental and physical breakdown!

It Works or Costs Nothing!

Psycho-Analysis is the mighty power that has restored lost nerve force to thousands. In my 140-page book "Psycho-Analysis-Kinks of the Mind," I tell you all about this great power—how you can use it to end nervousness—to restore lost vigor—to win back the glowing vitality and tireless energy of youth. *I show you how to become master of your nerves—once and forever.*

Write for this wonderful book today. Send only $1.00 for full payment. If you are not convinced of its great value, return the book within 5 days and your money will be instantly refunded.

DAVID V. BUSH, Publisher
Dept. PA-1093, 225 N. Michigan Blvd., Chicago, Ill.

Have Some Fun With Cold Light!

By Raymond B. Wailes

(*Continued from page* 1012)

heated with a Bunsen flame, the wires will conduct the heat along themselves with varying degrees. The copper wire will conduct the heat along itself very rapidly, the calcium sulphide about this wire will glow, visually indicating that copper has a greater thermal conductivity than the other metals tested.

Some kinds of yellow glassware called uranium glass, or canary glass, phosphoresce with a greenish-yellow hue. Placed in the rays from an arc lamp, the glass glows very much brighter. Ultra violet light from the carbon arc lamp causes the uranium glass to glow. Glass stops ultra-violet light, which is injurious to the eyes. If a pair of goggles or a strip of glass is held between the arc and the glass the effect of screening out the ultra-violet rays to some extent can be perceived. That pair of goggles which will prevent the glass from glowing the brightest is the safest to use in welding operations where goggles containing protective glass are used.

Most of the old time experimenters—those who were brought up on the Electrical Experimenter—will recall the Geissler tube. By soldering three mirrors of the ten-cent-store variety together as shown, the writer has produced a striking display with one Geissler tube of the fluorescent liquid type. One mirror is laid face up and the remaining two stood upright upon this one and soldered in such a position that the reflections of the Geissler tube can be seen the maximum number of times, when it is supported upon a wire hook fixed to the top of the mirrors. A good spark coil will produce beautiful effects. Fluorescent liquid Geissler tubes are usually filled with fluorescein solution.

Quinine sulphate will luminesce under certain conditions. When dried gently on a hot plate it become luminous. When the water which has been driven off reenters the quinine sulphate, the phosphorescence ceases. In determining certain factors in the emission of this luminescence, investigators desired that the luminescence could be seen for hours at a time. This was cleverly carried out by spreading quinine sulphate upon a slowly revolving metal disc which was heated at one spot with a burner. The crystals above the burner were always luminescent because of the dehydration, and as the dehydrated crystals were carried around on the revolving disc, they met moist air, became hydrated again and ceased to glow until the disc carried them back to the burner where is luminesced again. Thus luminescence was always in progress above the burner.

$21,000.00 for Spirits

For more than six years this publication has offered prizes totaling $21,000.00 for genuine demonstrations and proofs of spirit manifestations which we cannot duplicate by scientific and well-known means.

Up to the present time not one manifestation has been presented which by even the greatest stretch of the imagination could be considered genuine.

How many more years must this prize be offered? Spiritualists, please answer!

Build and Fly This Model Bremen Plane

By Arthur F. Selley

(*Continued from page* 1010)

Landing Gear

LANDING gear struts (42) are made from the formed reed "V's" supplied in the set. Cut the "V's" exactly to size of drawing. Shape and taper edges of streamlines (43) with sandpaper according to cross-section and side view drawing and glue to reed "V's" with groves inside. Attach tubular fittings (49) to anchor plates (12) with wood screws (44). Apply ambroid to inside of fittings and insert "V" ends.

Open axle fittings (46) wide enough to slip into place on reed "V's" and then clamp together with pliers. Insert axle (45) through fittings (46) and with spacer bushings (47) on axle, attach wheels (50).

Brace and square up landing gear with wires (48) attached diagonally between front fittings (49) and the axle.

Wings

USE the drawing as a layout. Make sure that the straight edge of the spars is on top as the tapered edge MUST BE underneath to give the proper dihedral to the wing. The larger wing spar (28) is placed forward and spar (29) in rear position, on drawing. Assemble the ribs, graduating them as shown. Be sure to have 1 inch projection on each spar at the shoulder. Apply ambroid at all joints, square up assembly and allow to dry. Next fit and glue entering edge (31) and trailing edge (32) to rib notches. Shoulder braces (33) and wing tip brace (34) are now fitted and glued into place.

IMPORTANT—Build one RIGHT and one LEFT wing.

Covering: Outline wing on bamboo paper with pencil and cut roughly to size. Cover under side first. Apply white glue to entering and trailing edges, shoulder and tip; stretch paper evenly and trim.

Doping: Use dope on both sides of the wings, thinned according to directions.

Stabilizer and Rudder

INTO the formed reed outline of the stabilizer (35) fit and glue spars (36) and (37), then stabilizer shoulder brace (38). Make sure that the two lower ends of the stabilizer outline are long enough to insert into tail-block holes.

Into rudder outline (39) fit and glue braces (40). Be sure to bind tail skid (41) with thread and glue. Insert skid through tail block and bend it according to the drawing by holding it over a spirit lamp.

Cover both sides of these tail pieces; apply dope according to directions.

Assembling

INSERT reed ends of stabilizer (35) into tail block (5); this is held without gluing.

Fit wing spar ends snugly into sockets (9) and (10), as no glue is used to hold them in place. If fitting is necessary, enlarge wing sockets. When the wings are in place they should have a slight dihedral angle. Use great care to see that the wings, stabilizer and rudder are not warped or twisted and are in their proper relation to the fuselage. Accurate truing-up of the model is absolutely necessary in order to make successful flights.

(*Continued on page* 1053)

NAME THIS HOUSE

$500.00 GIVEN

We Will Pay $500.00 Cash For the Most Suitable Name For This Beautiful House

ANY NAME may win. Offer open to everybody. Nothing to buy or sell. No Obligation.

This is a new Colonial Bungalow --- cozy, convenient --- yet a roomy house. It is meeting with such popularity that we are desirous of obtaining a suitable name for it for use in connection with our building program, and will pay $500.00 cash for the most suitable name suggested. There are no strings tied to this offer. Sending us a name for this house does not obligate you in any way. Nothing to buy or sell. We merely want a suitable name and are willing to pay $500.00 in cash for the best one sent in. Surely you can think of an appropriate name for such a beautiful home. Do not use more than two words. Any word or words may be used or any combination of words, such as Ridgelawn, Shadynook, Hearthome or names like Sunshine Inn, Journey's End, etc. No matter how simple your suggestion is, you cannot afford to neglect sending it in at once. Any name may win. Possibly you may have the most suitable name right on the end of your tongue this minute. If you have, send it in on the coupon below, and $500.00 in cash is yours.

FREE! In appreciation of your suggesting a name for this house real quickly, we will send you FREE and POSTPAID, the floor plans and blue print of this beautiful house. Understand, this does not obligate you in any way. We send you these free, with our compliments and if the name you send us is the most suitable one --- $500.00 in cash is yours. Fill out and mail the coupon TODAY --- QUICK!

HOME BUILDERS' SOCIETY
3793 Lincoln Way, Batavia, Illinois

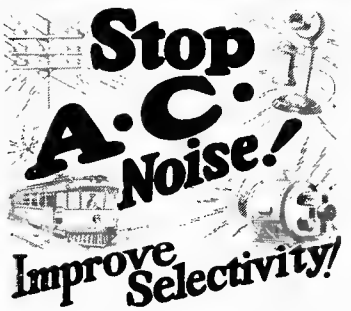
I suggest [_____]
as a name for your house.

My Name_____

Address _____

Town_____

State _____



RADIO reception may be made much more enjoyable by plugging in a Falck Claroceptor between the light socket and your set. By blocking out the line interference noises, this wonderful device also helps selectivity and distance. Tested, proved. Thousands now in successful use all over America. No change required in your set. Only equipment of the kind. Compact size: 3½ x 5½ x 2½". Made by pioneer radio manufacturer. At radio parts dealers, or write us for new free folder.

Falck **$7.50** *(With Cord and Plug)*

CLAROCEPTOR

Manufactured by ADVANCE ELECTRIC CO.
Dept. S.I., 1260 W. Second St., Los Angeles, Calif.
JOBBERS AND DEALERS—GET OUR PROPOSITION

AVIATION

taught at home

Study airplanes, motors, meterology and all aeronautical subjects just as taught in the famous Universal Aviation Schools. The Universal home study course is a remarkable extension of the training given in the world's largest system of flying schools. Learn aviation from experts. Clip the coupon. Get complete information.

FULL CREDIT AGREEMENT
Universal Aviation Schools agree to give graduates of Extension Course full credit of cost of course on a Universal Flying Course if taken later.

MAIL THIS COUPON

UNIVERSAL AVIATION SCHOOLS
Division of The Aviation Corporation
1158 Boatmen's B'k Bldg, St. Louis, Mo.

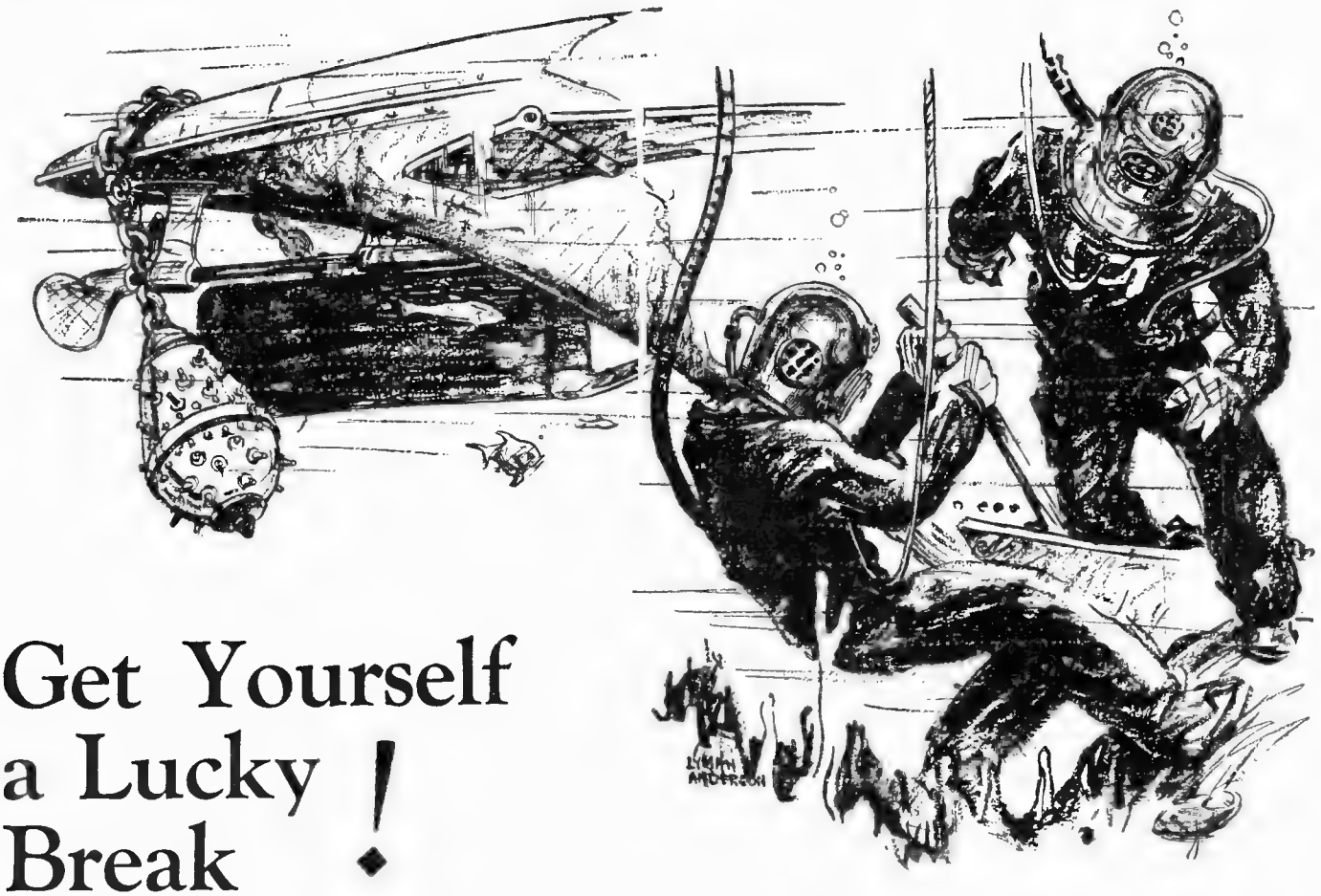
Please send literature describing Universal Aviation School's Extension Home Study Course.

Name _____ Age_____

Address_____

City_____ State_____

N886



Get Yourself a Lucky Break!

DO you know that if an obscure young Dane, living in Switzerland, hadn't fallen in love with a Swiss girl, you might not have had the radio? Do you know that if a heat wave had not swept over the United States, Calvin Coolidge might not have been President? That a sudden downpour of rain in Belgium one hundred and fifteen years ago was a direct cause of the Great World War? That if Alexander the Great hadn't got drunk on a "wild party" in Babylon, there would have been no Roman Empire?

Do you know that it's a hundred million to one chance that you were born? That nine men out of ten meet their wives by pure luck?

The great leaders of the world recognize and respect luck. More than that, they know how to take advantage of a lucky break. Do you? Let us help you.

Now Brief Stories Will Show You How

IN the February issue of Brief Stories Magazine, we have created a department called "LUCKY BREAKS" in which the great and near-great tell just how luck came their way, and how they recognized and took advantage of it. Probably your lucky day is just around the corner. Will you recognize it, when it comes? Will you know what to do? Read "LUCKY BREAKS" in Brief Stories Magazine for March and be prepared. Invest a quarter in Brief Stories at your nearest newsstand, and you may lay the foundation for a million, two million, ten million—who knows how much? Maybe reading "LUCKY BREAKS" will be *your* Lucky Break.

"LUCKY BREAKS" Is Just One Department in the New Brief Stories

BRIEF STORIES MAGAZINE also brings you a dozen or more corking good stories of adventure in strange, far-off lands every month. Read "Loot of The Little Jade Men" in which an organized band of Chinese Pirates pit their ability against a white man. The battle of wits and strength that follows is an epic of craftiness. Read "The Attack on Zeebruge," an eye-witness' account of one of the most important naval exploits in the World War. Read "Chained to a King" wherein a courageous white man gambles between a horrible death and a fortune in black pearls. Get them all in the February issue of Brief Stories, and settle down to several enjoyable, inexpensive evenings of choice reading entertainment.

See How It's Done in MARCH

Brief Stories

NOW ON SALE AT ALL NEWSSTANDS—25c a Copy

Build and Fly This Model Bremen Plane

By Armour F. Selley

(*Continued from page* 1051)

Flying

WITH the motor in place the model is ready to fly. If properly balanced, it should be slightly nose-heavy when held by a string attached to a pin in fuselage, directly over the main wing spars. If it is tail heavy, balance by adding weight to the nose.

Always fly the model into the wind.

Make a trial flight, giving the motor only 35 to 40 turns and launching from the hand. When the model is adjusted to fly on an even keel, it is ready for a flight rising from the ground.

Wind propeller not more than 125 turns. Select a smooth, hard runway, hold the propeller with one hand and the stabilizer with the other and place model on the ground. Release the propeller and at the same time gently push the machine forward. After a short run it will rise into the air and, if properly balanced, will make flights of from 100 to 125 feet.

KEY TO PARTS

Fuselage

Key No. Description

1—Fuselage nose piece (⅛" × 1" × 1¾" three-ply veneer).
2—Fuselage nose braces (3/32" square white pine).
3—Fuselage compression struts (1⅛" × 7/16" white pine).
4—Motor stick support, rear (1⅛" × 9/16" balsa wood).
5—Fuselage tail block (¼ × ¾" × 1" white pine).
6—Longerons (⅛" square white pine).
6a—Upper nose longerons (⅛" square white pine).
7—Fuselage struts (⅛" square white pine).
8—Fuselage reinforcement braces (3/32" square white pine).
9—Wing spar socket space front.
10—Wing spar socket space rear.
11—Fuselage wing spar socket reinforcement pieces, front and rear (⅛" × 9/16" balsa wood).
12—Combination wing and landing gear anchor plates (⅛" thick white pine).
13—Cabin brace, front (3/32" square white pine).
14—Cabin cross brace (3/32" square white pine).
15—Cabin roof (⅛" × 2" balsa wood).
16—Cabin window (.005 sheet celluloid).

Motor Unit

17—Propeller (10" adjustable pitch aluminum blades).
19—Propeller hanger (28 gauge sheet steel).
20—Propeller shaft (3/32" diameter steel wire).
21—Motor stick (⅛" × 5/16" white pine).
22—Motor (1/5" × ⅛" flat rubber).
23—Motor stick rubber hook (1/16" diameter steel wire).
24—Motor stick reinforcement pieces, front (1/16" × 5/16" white pine).
25—Motor stick reinforcement pieces, rear 1/16" × 5/16" white pine).
26—Propeller hanger wire clip (20-gauge steel wire)
27—Propeller shaft spacer bushing (3/32" diameter brass eyelet).

Wings

28—Wing spars, front (⅛" × ⅝" balsa wood tapered).
29—Wing spars, rear (⅛" × ½" balsa wood tapered).
30—Wing ribs (1/16" thick balsa wood).
31—Entering edge (3/32" × ⅛" white pine).
32—Trailing edge (3/32" × ⅛" white pine).
33—Wing shoulder braces (3/32" square white pine).
34—Wing tip braces (3/32" square white pine).

Tail Surfaces

35—Stabilizer outline (⅛" reed).
36—Stabilizer spars (1/16" × ⅛" white pine).
37—Stabilizer ribs (3/32" square white pine).
38—Stabilizer braces (3/32" square white pine).
39—Rudder outline (⅛" reed).
40—Rudder braces (3/32" square white pine).
41—Tail skid (⅛" reed).

Landing Gear

42—Landing gear V's (⅛" reed).
43—Landing gear slotted strut streamlines (3/16" × 11/16" balsa wood).
44—Screws, wood No. 1 (¼" roundhead, brass).
45—Axle, 7" (3/32" diameter steel rod).
46—Axle fittings (28-gauge sheet steel or brass).
47—Axle spacer bushings (3/32" diameter brass eyelets).
48—Landing gear cross wires (34-gauge tin wire).
49—Strut fittings, tubular (⅛" inside diameter brass tubing).
50—Wheels, aluminum disk, rubber tires (2" diameter).

In RADIO NEWS for March, 1930

Senatore Marconi, on the twenty-eighth anniversary of his first successful communication across the Atlantic, narrates in detail his experiences on that eventful occasion.

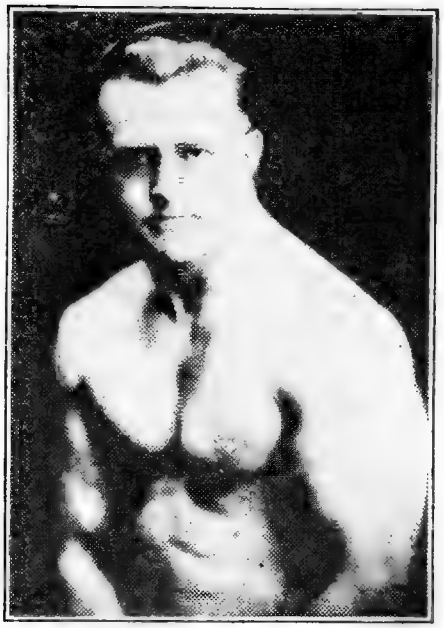
The Boy Scout Four, a receiver employing a popular circuit, is described, full constructional details being given. Here is a receiver designed and built by a Scoutmaster for Scouts, for use in Headquarters or Camp.

Carl Dreher tells of the difficulties encountered by the Sound Engineers in recording talkies where the "mike" must keep pace with the action in moving scenes.

Captain Frank M. Hawks, holder of the East-to-West and West-to-East transcontinental air speed records, describes for readers of RADIO NEWS the radio equipment he carries in his plane, and the important part it plays in his flights.

Two articles on the subject of automobile-radio receivers, one by Graydon Smith and Philip Eyrick and the other by Samuel Egert, outline the latest developments in receiver design.

How to build an audio oscillator; how to build a 245 amplifier-power supply, the description of a new Junior Radio Guide receiver, and the regular technical information departments make the March issue of RADIO NEWS one of outstanding interest and value to experimenters and broadcast fans alike.



EARLE LIEDERMAN—"The Muscle Builder" Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," "Endurance," etc.

MUSCLES and MUD

Remember how you used to make mud pies; how easy it was to fashion figures just the way you wanted them? You were a child then and it was great fun. Now you are grown and given to introspection. How often right now you picture in your mind, "The Man I'd Like To Be." This passing desire can be a reality. What satisfying enjoyment it is to be the **sculptor of your own body**—taking off a bit here and putting on a bit there—until you have shaped yourself into just what you want to be. **And how miraculously fast it all takes place!** Almost before you realize, you have a handsome, strong body with muscular arms and legs that go to make a commanding figure.

Guaranteed Results in Double-Quick Time

Earle Liederman, a college-trained man of an analytical and constructive mind, with over 20 years' experience in building muscles, is the sculptor to whom a body is like so much clay. He takes weak, run-down bodies and molds them into healthy, virile, deep-chested, broad-shouldered specimens. This Sculptor of Human Bodies makes it fun for you—a man's fun—serious and beneficial.

Development Is Miraculously Fast

Earle Liederman's scientific short-cut to a strong, muscular body reaches more than meets the eye. You **SEE** your outer self develop, but, you **FEEL** your inner self improve. Your kidneys, your liver, your lungs, your heart—all your internal organs become shaped to an orderly, normal functioning that means a new happiness to you—a living joy that only a healthy, virile body can give you. And the headaches, constipation troubles, aches and pains that are caused by a poorly modeled body, somehow miraculously disappear.

Be the Sculptor of Your Own Body

Let Earle Liederman tell you how to take the human clay in your own hands and make that body of yours just what you want it to be—**it's ever so easy with his method.** Simply fill in the coupon now and learn how to do it in the **FREE** book, **"Muscular Development."** It will come right to your home, entirely **FREE**, yours to keep with absolutely no obligation.

Send for His Free Book

"Muscular Development"

—It's Free—

Take it and read it. It's the peppiest piece of literature you ever flashed your glimmers on. And 48 full-page photos of himself and some of his numerous prize-winning pupils. This is the finest collection of strong men ever assembled into one book. Look them over—Doctors, lawyers, merchants, mechanics, and every line of trade you can think of. You'll never let this book get out of your hands again. And just think—you're getting it for nothing. Don't hesitate—there's no string attached to it. Grab it.

Take your pen or pencil and fill out the coupon. But **do it now**—before you turn this page.

EARLE LIEDERMAN

Dept. 2703 305 Broadway New York City

EARLE LIEDERMAN
Dept. 2703, 305 Broadway, New York City

Dear Sir—Please send me absolutely FREE and without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

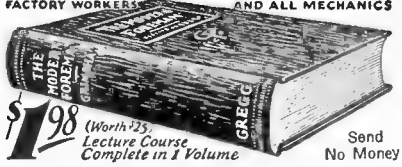
Name ..... Age.....

Street .....

City ..... State.....

FOREMEN!

FACTORY WORKERS AND ALL MECHANICS



$1.98 (Worth $25) Lecture Course Complete in 1 Volume — Send No Money

Every foreman, factory worker, manager and ambitious mechanic will find a gold mine of inside information in "The Modern Foreman" by Robt. Grimshaw. The 28 chapters of this great work are shop talks pointing the way to success, efficiency, better pay and the job higher up. A complete study course in leadership; a handy daily reference and guide.

VALUABLE INFORMATION

SUBJECTS COVERED INCLUDE:—The Magic Wand of Efficiency, The New Type of Foreman, Teamwork, The Kicker, The Agitator, Bonus Plans, Self Improvement, How to Handle Men, Hiring and Firing, Assigning Men to Jobs, How to Keep Records, How to Cut Out Waste of Time and Materials, New Inventions, Modern Methods, The Inspector, Health and Character Requirements, What the Foreman Should Know, Mathematics, Business Law, the Foreman as "Top Sergeant," Factors of Success, Leadership, What is "Labor," Time and Idleness, Knowledge is Power, "Morale," The Value of Mistakes.

SPECIAL SALES PRICE

"The Modern Foreman" has 297 pages, quick reference index, many tables, diagrams, illustrations and forms; big type, easy to read and understand; rich binding, gold stamped. Size 6 x 9 x 1¼. Reg. price $2.50. Our special sale price $1.98. Send no money. Satisfaction guaranteed. Mail this coupon TODAY!

GREGG PUB. CO., 20 W. 47th St., New York, N. Y.
Send me "The Modern Foreman." I will pay postman $1.98 and postage on arrival. My money is to be refunded if I am not satisfied.

Name .....

Address ..... S I-3

15-25 Miles

Magic Eyes $7.95

8 Lenses Magic Eyes that will extend your vision over 15 to 25 square miles. See the multitude of things these powerful lenses will show you. They conquer distance and bring distant objects before your very eyes. Wonderful for hunters, naturalists, tourists, etc.

Only 8 Lens Galilean Binocular under $30

FREE TRIAL

Eight fine sparkling precision ground day and night lenses. No wonder they give crisp, clear cut detail, expansive field and great range. Only 4⅜" high. Fine compass on top. Graduated focusing scale 1 to 12 on middle bar. Case and straps free. Order one today while they last. Only $7.95 C.O.D. **Free Trial for Five Days.** Money back if you want it.

CATALOG

OVER 200 GLASSES ALL MAKES—$1—$110

Everything in binoculars, field glasses, telescopes and optical instruments. The finest and largest assortment in America. Catalog gives all information how to choose the best for your individual needs at the LOWEST PRICE.

Try America's Leading Binocular House First

DuMAURIER CO. Dept. 173 ELMIRA, N. Y.

WANTED MEN

To Manufacture Metal Toys and Novelties

Big demand for 5 and 10c store Novelties, Ashtrays, Toy Soldiers, Animals, Auto Radiator Ornaments, etc. We co-operate in selling goods you make; also buy these from you. Small investment needed to start and we help you build up. WE FURNISH COMPLETE OUTFITS and start you in well-paying business. Absolutely NO EXPERIENCE and no special place needed. A chance of a lifetime for man with small capital. Write AT ONCE if you mean strictly business and want to handle wholesale orders now being placed.

METAL CAST PRODUCTS COMPANY
DEPT. E 1696 Boston Road New York City

Rider Agents Wanted

Select from 44 Styles, colors and sizes of Mead Bicycles. Ride and exhibit sample RANGER and make money.

Factory to Rider: We ship on approval for 30 Days' Free Trial, direct from FACTORY. Get our marvelous offers. Easy Payments. $5 down.

Tires lamps, horns, wheels, parts, equipment, and repairs at half usual price. Established 36 years.

Mead CYCLE COMPANY Dept. L-107, CHICAGO

Write us today for free catalog

Lindy Gets New Wings

(*Continued from page* 1005)

their gasoline before the additional burden of ice has been collected.

For ice to form on the wings, it is first necessary that the plane fly through an area of relatively high humidity and secondly, that the temperature be below 32 degrees Fahrenheit. To prevent ice, the wings of test planes are treated with various types of oils, glycerine and preparations. Contrary to expectation, it is found that particles of water meeting with a greased surface, become partially imbedded and are actually held on the wings and freeze there. Other particles of water also freezing, coalesce and a large piece of ice forms on the surface.

Air temperature indicators enable the pilot to know, by the readings of the instrument during flight through cold, humid areas, when there is danger from ice and permit him to alter his course, seeking the warmer air.

The air temperature indicator consists essentially of three parts, the first being a bulb which is mounted in such a position that it will be directly in line with a stream of air. This connects with a tube having a bore of only six-thousandths of an inch and a Bourdon tube. A Bourdon tube is made of seamless copper, is flat, and closed hermetically. The entire tubular section is filled with xylene under pressure. When the bulb of the instrument is subjected to heat or cold, the liquid expands or contracts. The expansion or contraction causes the curved Bourdon spring to distend or become flatter. This action in turn produces a winding or unwinding motion and turns the needle on the dial. Inside of the coil of the Bourdon spring is a compensating spring, the purpose of which is to correct any changes in temperature which may occur at the head of the instrument or in the cockpit of the plane. The compensating spring is a bi-metallic strip, wound in such a way that cooling the head of the instrument causes the spring to bend giving an opposite effect to that of the Bourdon coil.

All of the instruments on the dash of Lindbergh's new plane were built by the Pioneer Instrument Co., noted for the construction of instruments for aircraft purposes. The ice warning indicator is a Moto-Meter product.

It might not be amiss to mention that the rear cockpit in which Mrs. Lindbergh will sit is provided with an altimeter and air speed indicator and a rate-of-climb indicator, duplicates of those in the front cockpit.

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. The dealer will then be in a position to supply copies to you regularly every month. If you are interested in reserving your copy every month, do not fail to do this. It costs you nothing to do so.

There's an air of hospitality that you'll like

AT THE HOTEL

PICCADILLY

227 WEST 45th ST. of BROADWAY
NEW YORK

ADJACENT TO EVERY ACTIVITY
600 BRIGHT SUNLIT ROOMS
EACH WITH BATH,
ELECTRIC FAN, ICE WATER
SINGLE ROOM AND BATH $3.00
DOUBLE ROOM AND BATH $4.00
Exceptional Restaurant & Grille
WIRE AT OUR EXPENSE FOR RESERVATIONS
F. D. SOFIELD - MANAGING DIRECTOR

Anyone CAN LEARN!
No talent or experience necessary. Fascinating work. Pays big money. Complete instruction book TELLS ABOUT: Alphabets, Colors, HOW TO MIX PAINTS, Show Cards, Window Board and Wall Signs, Ready made letters, Gilding, TRICKS OF THE TRADE, also gives 100 Alphabets and Designs. Book bound in flexible Imt. leather, gold edges, and four ball bearing Show Card Pens. Book and Pens sent postpaid for $3.00. (C. O. D. 10c extra.)
How to Paint SIGNS and Show Cards
300 ALPHABETS
OgilviePub.Co.,57RoseSt.,Dept.209NewYork
EARN MONEY IMMEDIATELY—
WE FURNISH EQUIPMENT TO START

LEARN TELEGRAPHY WITH TELEPLEX

Be an expert Morse or Continental code operator! BIG PAY— TRAVEL — FUN — ADVENTURE. After a few short weeks of practical study with Teleplex you will be an expert operator. This amazing instrument teaches you right in your own home. Works automatically. No knowledge needed—beginners learn at once! NOT A SCHOOL. Free 10 days' trial. Write for FREE booklet T-11.

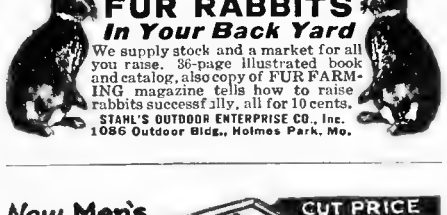
TELEPLEX CO., 72 Cortlandt Street, New York City

ANY BOOK IN PRINT

Delivered at your door. We pay the postage. Standard authors, fine editions, new books, all at biggest savings. Be sure to send postcard for Clarkson's catalog.

FREE Write for our great book catalog. This catalog is a short course in literature and is so used by some of America's leading universities; 300,000 book lovers buy from it. Free if you write now.

CLARKSON PUBLISHING CO.,
351 CLARKSON BLDG., CHICAGO, ILL.



RAISE CHINCHILLA

AND NEW ZEALAND WHITE

FUR RABBITS

In Your Back Yard

We supply stock and a market for all you raise. 36-page illustrated book and catalog, also copy of FUR FARMING magazine tells how to raise rabbits successfully, all for 10 cents.

STAHL'S OUTDOOR ENTERPRISE CO., Inc.
1086 Outdoor Bldg., Holmes Park, Mo.

New Men's StrapWatch

CUT PRICE SALE

$3.99

Two years guarantee with this jeweled Swiss watch. Choice in square, tonneau round or cushion shape—same price. Radium dial, accurate timekeeper. Satisfaction guaranteed. Rush order. Send no money. Pay postmaster $3.99. JENKINS, 685 Broadway, New York, Dept. 24-F-3

EASY TO BLOW. Easy to finger. Easy to play in perfect tune. Learn quicker and win greater musical success. Sousa and the world's greatest artists endorse Conns. They have proved Conn superiority. The secret is in Conn's patented construction. Many exclusive features. Yet they cost no more.

FREE TRIAL, EASY PAYMENTS. Any Conn Band or Orchestra instrument sent on free trial. Liberal Easy Payment Plan. Write for special offer.

Send For FREE BOOK. Describes your favorite instrument. Gives history, place in band, points out money making opportunities. Illustrates newest models in natural colors. Mention instrument.

C. G. CONN, LTD.
356 Conn Bldg., Elkhart, Indiana

CONN
World's Largest Manufacturers of
BAND INSTRUMENTS

Write for FREE BOOK
Mention Instrument

6 Ft. LONG

FREE!

Boys! Here's the great Navy model Airship. Large 6-foot air bag with inflators, parachute with automatic release and complete instructions for flying. Will fly for miles at height of 1000 feet. Great chance to study aerial navigation. Send name and we'll send 5 of our new art pictures to dispose of on special 25c offer. Send the $1.50 you collect and as a reward for this service we will send this wonderful Airship with full instructions free.

C. M. THOMAS, 337 W. Madison St., 3-K-22, Chicago

LAW **STUDY AT HOME**

Become a lawyer. Legally trained men win high positions and big success in business and public life. Be independent. Greater opportunities now than ever before. Big corporations are headed by men with legal training. Earn

$5,000 to $10,000 Annually

We guide you step by step. You can train at home during spare time. Degree of LL.B. conferred. LaSalle students found among practicing attorneys of every state. We furnish all text material, including fourteen-volume Law Library. Low cost, easy terms. Get our valuable 64 page "Law Guide" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 3384-L, Chicago
The World's Largest Business Training Institution

Moulds as low as $1.50 each.

Cast Your Own Lead Soldiers, Indians, Hunters, Wild and Farm Animals

222 Wonderful "True to Life" Models. Easy and inexpensive to make. I furnish all necessary material including enamel. Send 5c Stamp for Illustrated Catalogue A.

H. C. Schiercke, 1034-72nd St., Brooklyn, N. Y.

Send To-day for the
"Electrical Worker's Friend"

An electrical book of 66 motor drawings with complete instructions for rewinding and reconnecting A. C. motors. Special at **$3.00**

Or write for full particulars of this valuable book

SMITH & SMITH PUBLISHING CO.
Dept. B., Valencia, Pa.

BE AN OIL EXPERT

TRAINED MEN NEEDED!

Geologists, Drillers, Refiners, Salesmen are at a premium! New, Easy, Practical Way to learn at home in spare time! Write today! FREE Booklet! Petroleum Engineering University Dept. 203, Fort Wayne, Ind.

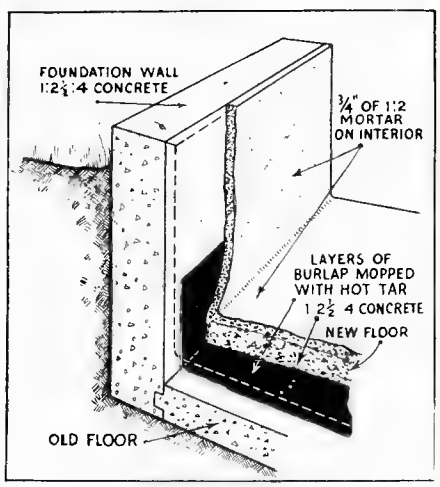
Make That Wet Cellar Dry

By Josef W. Von Stein

(*Continued from page* 1013)

an actual pool on their cellar floors.

"Suppose I tell you what I think will remedy your individual conditions," went on Joe. "In the first place, if the condition is merely one of dampness, as in Bill's case, it may be sufficient to apply a wall coating, or watertight seal, over all walls and floor, consisting either of Portland cement mixture, or the mixture combined with such a waterproofing compound as I mentioned before. Before applying this inner seal, all wall and floor surfaces must be thoroughly cleaned. If the construction is stone, brick or other masonry, mortar joints should be raked out to a depth of ½-inch. If there are cracks in the wall these should be filled with a 1:1½ cement-sand mortar mixed to the consistency of moist earth, and rammed into the crack with a calking tool or ball-peen hammer. All surfaces should then be brushed with a slush or grout of cement and water mixed to the consistency of thick cream. While this grout is still wet, apply the final inner waterproofing lining. Wherever possible, the application of the coatings should be made continuous until completed. Where construction joints are necessary, they should be carefully cleaned and slushed with the described grout before the additional coating is applied.



Construction suggested when it is more convenient to apply treatment from inside, to prevent entrance of ground water. Thickness of new floor depends on height of water above basement floor in wet weather.

If it is impossible to carry out this work during dry weather, seepage through cracks is sometimes relieved by inserting pipes to serve as seep holes in the wall. These are plugged after the work is completed. The coat must be given a chance to thoroughly dry out before subjecting it to the seepage of water. The thickness of this inner waterproofing seal is dependent upon the maximum head of ground water, which is indicated by the height to which the water has ever risen over the floor of the cellar. If the condition is merely one of dampness or very slight seepage as I believe is your case, Bill, a wall coating ¾-inch thick carried up to 1 foot above grade may be sufficient."

(*Continued on page* 1056)

PICK YOUR JOB!

Railway Postal Clerks
City Mail Carriers
City Post Office Clerks
General Office Clerks

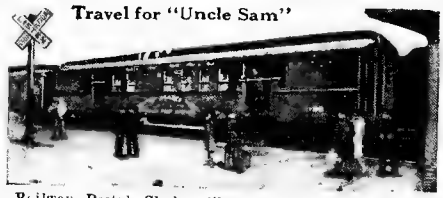
NO "LAYOFFS"

These are steady positions. Strikes, poor business conditions, or politics will not affect them. Government employees get their pay for twelve full months every year.

$1,900 to $2,700 A YEAR

Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.17 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each pay day.

Travel for "Uncle Sam"



Railway Postal Clerks, like all Government employees, have a yearly vacation of 15 working days (about 18 days). On runs, they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation their pay continues just as though they were working. They travel on a pass when on business and see the country. When they grow old, they are retired with a pension. Spring examinations expected everywhere.

CITY MAIL CARRIERS
POST OFFICE CLERKS

Clerks and Carriers now commence at $1,700 a year and automatically increase $100 a year to $2,100 and $2,300. They also have 15 days' paid vacation. City residence is unnecessary.

GOVERNMENT CLERK—CENSUS CLERK
(Open to men and women 18 to 50)

Salary $1,260 and $1,440 to $2,500 a year. Pleasant clerical and filing work in the census and other government departments at Washington, D. C., and other cities throughout the country.

IS YOUR JOB STEADY?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU GET $1,900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2,100 to $2,700 A YEAR?

YOU CAN GET THEM

Country residents and city residents stand equal chance. Experience is usually unnecessary, and political influence is not permitted. Let us show you how.

GET FREE LIST OF POSITIONS

Fill out the following coupon. Tear it off and mail it today—now, at once.

DO IT NOW—This investment of two cents for a postage stamp may result in your getting a Government Job.

FRANKLIN INSTITUTE,
Dept. F-177, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of the position checked below; (2) Free Copy of 32 page book, "How To Get a U. S. Government Job"; (3) A list of the U. S. Government Jobs now obtainable; (4) Send particulars telling how I can get the position I have checked.

- ☐ Railway Postal Clerk ..... ($1900-$2700)
- ☐ Post Office Clerk ..... ($1700-$2300)
- ☐ City Mail Carrier ..... ($1700-$2100)
- ☐ Rural Mail Carrier ..... ($2100-$3300)
- ☐ Government Clerk—Census Clerk ..... ($1260-$2500)
- ☐ Income Tax Auditor ..... ($2300-$3100)
- ☐ Prohibition Agent ..... ($2300-$2800)

Name .....

Address .....

Use This Coupon Before You Mislay It.

EXCELLO RADIO

Style No. 154

Genuine Screen Grid radio with dynamic speaker and high grade cabinets for radio or radio-phonograph combinations.

Write today for free illustrated catalog of Radio and Radio Cabinets

EXCELLO PRODUCTS CORPORATION
4832 West 16th Street
CICERO, ILLINOIS

NOW—Become an Electro-Technician By this Amazing New Method

Train the NEW PRACTICAL WAY! Prepare to meet the tremendous demand for Electro-Technicians in all branches of electricity. Splendid opportunities. BIG PAY for trained men. Now is the time to start.

BRINGS SCHOOL TO YOUR HOME

Home Shop-Laboratory worth over $60.00 yours without extra cost. Enables you to "learn by doing." Not by texts alone—but with patented new Unit Board System. Brings full-size Electrical Equipment right into your home. Train this fascinating new way under supervision of engineers of America's great Electrical School.

FREE 48-PAGE BOOK

Write today for FREE illustrated 48-page book giving full details of how you can become an ELECTRO-TECHNICIAN by the wonderful new Home Shop-Laboratory Method. No obligations. Mention age.

Dept. 26, EXTENSION DIVISION

SCHOOL of ENGINEERING of Milwaukee

BARTLETT DROP-FORGED COMPOUND LEVER SNIPS

Made of high-grade Crucible Tool Steel, accurately tempered. Cuts metal up to 18 gauge easily. 7-inch size just right for household use. 7-inch, stamped, $2.70; 8-in forged, $4.00; 10-in. forged, $6.00; 12-in., $8.00; 14-in., $9.50. Your dealer has them or can get them from his jobber. If he will not we will ship prepaid in U. S. at above prices

FOLDER ON REQUEST

Bartlett Mfg. Co., Dept. 23, 3003 E. Grand Blvd., Detroit, Mich.

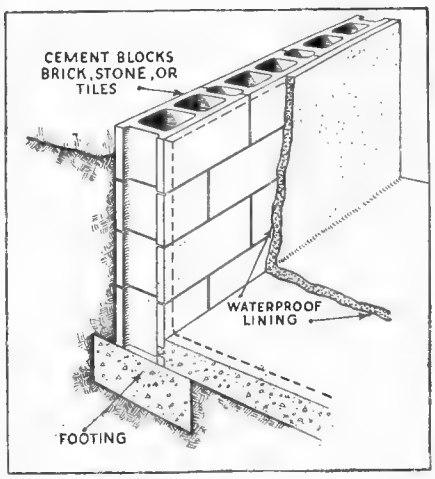
Make That Wet Cellar Dry

(*Continued from page* 1055)

"But what about the deplorable standing water in my cellar," asked Harry hopefully.

"Your task will be a trifle more difficult than Bill's," he finally agreed. "Your first problem is to get rid of the standing water. You may succeed in this by merely chopping some outlet holes in the floor. On the other hand, if there is a continuous leakage, employ a pump. Or some small local contractor will keep the cellar dry while you do the actual work of waterproofing.

"After you have a fairly dry surface, examine the walls and floor for cracks. Cut them out to a depth of about 2 inches, forming narrow grooves, and fill the spaces with hot tar or a mixture of tar and sand. In order to provide a further seal against the entrance of ground water, a membrane, composed of several layers of tarred felt or burlap mopped with hot tar, pitch or asphaltum, should be placed over the entire floor. Be sure to run these layers a considerable distance upward along the walls, Harry—at least a distance of one foot. This new flooring will depend in thickness upon the amount of upward water pressure you have to contend with."



Protect cellar against seepage or leaks by applying a water-proofed cement lining, consisting of Portland cement mixture combined with a water-proofed compound.

"How do I figure that?" asked Harry.

"Merely remember that, for every foot ground water rises above floor level, a water pressure of 62½ pounds per square foot is developed against the lowest point. If an unreinforced floor is used—and I believe that this type will do quite nicely in your case—it must resist by its own weight the water pressure from below. Considering that concrete 12 inches thick weighs about 144 pounds for each square foot of surface area, the unit weight of flooring becomes 12 *pounds per square foot for each inch of thickness.* Jot down this fact."

Joe continued, "A 6-inch slab is therefore needed to resisit the upward pressure of a 1-foot head of water. Where a plain slab would be excessively thick, a reinforced slab would undoubtedly be more economical. But I don't think you'll have to worry about that, Harry. Such a

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian Instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour — After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

Easy Lessons — Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. Play as you play.

GIVEN *when you enroll* **—a sweet toned HAWAIIAN GUITAR, Carrying Case and Playing Outfit Value $18 to $20** *No extras-everything included*

WRITE AT ONCE for attractive offer and easy terms. A postcard will do. ACT!

OTHER COURSES Tenor Banjo, Violin, Tiple, Tenor Guitar, Ukulele, Banjo Ukulele. Under well-known instructors.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc.
9th Floor, Woolworth Bldg., Dept. 240 New York, N. Y.

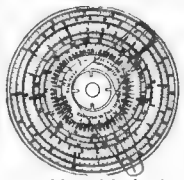
Approved as a Correspondence School Under the Laws of the State of New York—Member National Home Study Council.

MORE PAY with QUAKER FREE OUTFIT

FREE SHIRTS TIES CASH BONUS GIVEN

Earn big money right from the start. Let Quaker help you. Wonderful free Sample outfit gets orders everywhere. Men's Shirts, Ties, Underwear, Hosiery. Unmatchable values. Unique selling features. Ironclad guarantee. You can't fail with Quaker. Write for your Free outfit NOW.

QUAKER SHIRT CORPORATION
Dept. L-3 1107 Broadway, N. Y.



THE MIDGET SLIDE RULE

instantly adds, subtracts, multiplies, divides, solves proportion, gives all roots and powers. Logarithms, Sines, Cosines, Tangents, Cotangents, etc. Also gives decimal equivalents, lettered and numbered drill and tap sizes.

The Engine-divided scales are on white finished aluminum and are grease and waterproof. Diameter 4". Price with Instruction Book, $1.50. Pocket Carrying Case, 50c extra, Cash or C.O.D. Catalogue free. Your money back if you are not satisfied.

GILSON SLIDE RULE COMPANY. Stuart, Florida
(SLIDE RULE MAKERS SINCE 1915)

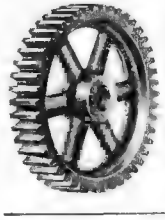
Learn to PAINT SIGNS and SHOW CARDS

We quickly teach you by mail, or at school, in spare time. Big demand. Big future. Interesting work. Oldest, foremost school.

EARN $50 TO $200 WEEKLY

Otto Wiegand, Md., home-study graduate, made $12,000 from his business in one year. John Vassos, N. Y., gets $25 for a show card. Crawford, B. C., writes: "Earned $200 while taking course." Write for complete information.

DETROIT SCHOOL OF LETTERING
179 Stimson Ave. Est. 1899 DETROIT, MICH.



GEARS

In stock—immediate delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue-prints and inquiries.

Write for Catalog No. 40

CHICAGO GEAR WORKS
769-773 W. Jackson Blvd., Chicago, Ill.

AVIATION Information FREE

Send us your name and address for full information regarding the Aviation and Airplane business. Find out about the many great opportunities now open and how we prepare you at home, during spare time, to qualify. Our new book "Opportunities in the Airplane Industry" also sent free if you answer at once.

AMERICAN SCHOOL OF AVIATION
Dept. 1423 3601 Michigan Ave. CHICAGO

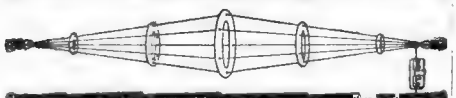
NEW SCIENTIFIC WONDER "X-RAY" CURIO

10c **3-25c**

BIG FUN BOYS You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. FREE—PKG. RADIO PICTURE FILMS. Takes pictures without camera. "You'll like 'em." 1 pkg. ea. 25c order.

MARVEL MFG. CO., Dept. 83, NEW HAVEN, Conn.

LIFE-TIME DX AERIAL



Guaranteed Double Volume and Sharper Tuning

BRINGS IN STATIONS YOU NEVER HEARD BEFORE

No. 30—LENGTH 30 FEET: Assembled ready to string up. Brings in volume of 150-ft. aerial but retains the selectivity of a 30-ft. aerial. Rings are heavy gauge solid zinc. Duplicates in design and non-corrosive materials the aerials used by most of largest Broadcasting Stations. Design permits using this powerful aerial in 30-ft. space (preferably outside). Sharpens tuning of any receiving set because of short length but has enormous pick-up because 150-ft. of No. 14 enamelled wire is used. Made for owners of fine radio sets who want great volume on distance without destroying sharp tuning. (Also used by many owners of short-wave outfits.) "Makes a good radio set better." We include with each aerial one lightning arrestor (approved by Insurance Underwriters). PRICE $10.00

No. 60—LENGTH 60 FEET: Assembled—ready to string up. "BIG BOY" Size (same description as above except that 300-ft. of wire is used, making this the most efficient and powerful aerial possible to manufacture). PRICE $12.50

Send in $1.00—Balance C.O.D. If unable to buy at your dealer.

THOROLA RADIO PRODUCTS
1014 So. Michigan Blvd., Chicago, Illinois

LEARN CARTOONING
At Home—In Your Spare Time

The famous Picture Chart Method of teaching **original** drawing has opened the door of success for hundreds of beginners. Whether you think you have talent or not, send for sample chart to test your ability, and examples of the work of students earning from $50 to $300 per week. *Please state your age.*

THELANDONSCHOOL
1460 National Bldg., Cleveland, O.

LEARN AVIATION AT HOME

Enjoy the FINEST HOME STUDY COURSE in AVIATION TRAINING with U. S. Government APPROVED SCHOOL. You can easily pay in small payments. WRITE Today!

VON HOFFMANN AIRCRAFT SCHOOL
59 Lambert St. Louis Flying Field, St. Louis, Mo.

Free Quick— to ANY Worker Foreman President Executive

If you work on ANY product that is used by concerns that serve the public; or used in business or homes, (for utility, beauty, or luxury)—GET THE FACTS that are back of this Tidal Wave of new quick thinking in all industries. . . A Look AHEAD, in manufacturing, in methods, models, competition, *costs*, prices, Standards of Living. . . How—right NOW—articles and parts are being made, far easier, faster, at lower cost; and "righter."

Fact-Sheets of Industry

will give you a look AHEAD that will start you thinking; probably amaze you. Full CONTENTS OUTLINE is free; no obligation. Just state your name, address, company's name and products, and whether you want the Facts for self or company. Postal will do. Or margin of this page. Save this. Do not trust to find it again; write NOW. Address: Fact-Sheets of Industry; NVF Co., Dept. J-1, Wilmington, Del.

NVF

Offer is by NATIONAL VULCANIZED FIBRE Company; its Divisions and Associated Industries. Special working methods; special Phenolites; "righter" Bakelites; parts, materials, and ways; Material Handling; etc.; besides Vulcanized Fibre. Serving America's Industries, from Smallest to Greatest.

slab would be anchored to the walls and to intermediate partitions or columns, to obtain the necessary support."

"No, I don't think the head of water in my cellar is great enough to entail this reinforced flooring, Joe," agreed Harry.

"Very well, then," answered Joe. "You can readily determine the thickness you require for the new floor. You ought to make it of a 1:2:4 mix. Be sure to get a good joint with the tarred membrane covering the lower portions of the walls. Finish the job with a uniform coating of ¾-inch thickness of 1:2 cement mortar or a mixture combined with the patented waterproofing compound."

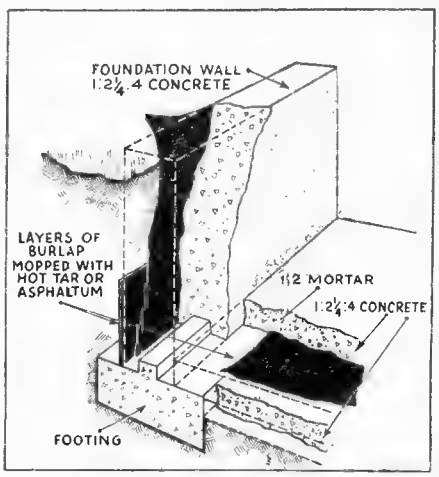
While Joe stopped to light a fresh cigar, Harry asked, "You mean that this finish coat should be applied over the floor, as well as the walls, don't you, Joe?"

Joe laughed. "Certainly, finish off the interior of the walls and the floor with this mortar or waterproof combination coating. And, another thing—be sure that you get a perfect bond where the walls join the floor. I would advise you to see that this joint is coved. And don't put this finishing coat over the new concrete floor too soon. Fresh concrete should be kept moist from 7 to 10 days to produce best results. Therefore, wet the new floor down several times daily during this time. Please remember also that proper ventilation of basements is necessary to prevent condensation of warm, moist air on the colder wall surfaces. Thus, both of you ought to keep your cellar windows open on cool, dry days, but close them when the outside is sultry and the humidity is high. But I guess you won't worry about this condition at this time of the year."

"No," agreed Harry, "but I think we all ought to think about the condition of our beds at this time of the night. I know, it's time Harry was running along."

"We second the motion," chimed in his two companions.

"But let me know how you get along with the new home-making jobs I've suggested," advised Joe as the trio parted for the night.



Exterior treatment against ground water pressure in low ground or similar conditions. 1:2 mortar means 1 pail Portland cement to 2 pails sand. 1:2¼:4 indicates 1 pail cement, 2¼ pails sand, 4 pails gravel.

Readers will find "Have a Basement Playroom," Page 986, as well as Mr. Von Stein's article, extremely useful in preparing a plan for the contest announced on Page 980.

***Here's That Long-Hoped-for* Handbook *for Your* Home Workshop**

Just published—the book that will show you how to be your own furniture builder — electrician — radio expert — painter—decorator—toy maker—model mechanic —garden craftsman—metal worker—boat builder—and general all-around construction and repair man—with the expert help of

THE HOME WORKSHOP MANUAL

A single-volume encyclopedia of plans and methods of construction and repair giving practical directions for making scores of useful and beautiful things.

Just the book you've always wanted. Gives you clear, complete, and simple directions for doing expertly all those jobs of craftsmanship you've often thought of doing. A mine of ideas and a whole library of practical plans and usable directions, offering the expert guidance of twenty well-known specialists.

Never Before Have So Many Plans and Directions Been Assembled in One Volume

The scope of *The Home Workshop Manual* is really amazing. It is hard to believe that such a great variety of things to make can be covered in such complete detail until you actually see the book and look through its sixteen big sections which cover:

1. Building Fine Furniture by Hand.
2. Furniture of Modern Design.
3. How to Use Small Woodworking Machinery.
4. Repairing Old Furniture.
5. Toys to Delight the Children.
6. Novelties — Ornamental and Amusing.
7. Woodturning Simplified.
8. Decorative Metal Work.
9. Model Making.
10. Radio and Electrical Projects.
11. Improvements for House and Garden.
12. Boats and Sports.
13. Painting and Decorating.
14. Woodworking Tools.
15. Equipment to Make for Your Home Shop.
16. Better Home Workshop Methods.

496 Pages; More than 500 Illustrations.

Examine It FREE

You need send no money now. The Manual will be sent you *on approval* for ten days. If you are not convinced that it is the finest work of the kind ever produced and worth many times its cost, you may return it and owe nothing. If you keep it, remit its remarkably low price of $5.00.

ORDER ON THIS COUPON

Popular Science Publishing Co.,
381 Fourth Avenue, New York, N. Y.

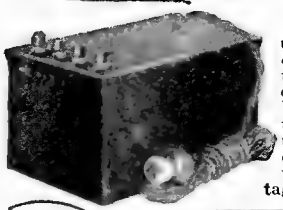
Please send me the newly published HOME WORKSHOP MANUAL for free examination. Within ten days of receipt I may return the volume, if I wish, and owe nothing. If I keep it I will remit $5.00 within ten days which pays in full for the Manual. S. & I. 3-30

Name .....

Address .....

City ..... State .....

MAKE GOOD RECEPTION EASY



Thousands of users marvel at the difference in reception with a Townsend "B" Power Unit. Full, sweet tone, clarity, volume and greater distance are among the many advantages reported daily.

ONLY $6.85 COMPLETE

TOWNSEND "B" POWER UNIT

Hooked up in a few minutes; just plug into the light socket and forget it. Delivers up to 100 volts on any set—D.C. or A.C.—any cycle.

Approved and passed by the rigid laboratory tests of "Popular Radio" and "Radio News."

Over 150,000 Now in Use!

There's no longer any reason for putting up with the expense and undependable performance of "B" Batteries—when you can own a good "B" Power Unit for $6.85. Over 150,000 Townsend "B" Power Units now in use—a substantial proof of satisfaction.

Send Only $1.00

Send name and address with only $1.00. On arrival of Townsend Power Unit pay postman $5.85 plus postage. Try out ten days, then, if it fails to do everything we say, return it and money paid us will be refunded. Make a REAL receiver of your set.

PROOF

Your Eliminator brings my 7 tube Atwater Kent right up with any electric set in this neighborhood. It sure is wonderful.
E. W. Carter, Norwich, Conn.

Your Eliminator has given constant service for two years. Can get practically anything with it that friends with high powered A C sets have difficulty in bringing in nearly so well.
F. W. Schmidt, Jr., Jacksonville, Fla.

TOWNSEND LABORATORIES
725 Townsend St. Chicago, Ill.

Electricity!

Learn in Los Angeles

Be an electrical specialist. Gain quick success in this most fascinating and profitable field. Learn at National in the center of tremendous electrical projects costing more than $100,000,000.00 — unlimited opportunities now.

Practical, intensive training by National's job-experience method in 6 to 9 months. All technical essentials included. School endorsed by leaders in electrical industry. You learn all branches of electricity; radio. Million dollar institution; all modern equipment and training facilities. Life scholarship. No age limit. Free employment service. Over 17,000 successful graduates. 23rd year. Big, illustrated 84-page catalog sent FREE. Write today.

FREE BOOK

NATIONAL ELECTRICAL SCHOOL
Dept. 305EF 4006 So. Figueroa, Los Angeles, Calif.

CHEMISTS

Catalog illustrating 2500 Chemist's Supplies, 5,000 Chemicals, Minerals, Drugs, etc., and listing 1,000 scientific books sent for 50c. Glass Still as illustrated. Capacity of flask 1 qt. Complete $8.

LABORATORY MATERIALS CO.
635 East 71st St. Chicago, U.S.A.

LEARN TO DRAW!

Remarkable book—"COMMERCIAL ART AND CARTOONING." Explains how to make illustrations for books, advertisements, etc. Also how to become a Cartoonist. NO CORRESPONDENCE COURSE — Book tells all—14 chapters—125 illustrations. Explains Elementary Drawing; Still Life; Pen, Ink, Charcoal and Crayon Work; Cartooning, etc. Bound Flexible, Im. Leather. Postpaid for $2.00 (C. O. D. 17c extra) OGILVIE PUB. CO., 57 Rose Street, New York, Dept. 139

POST PAID $2.00

Cold Light in Perfect Form Found in Fire-fly Species

By William Lemkin, Ph.D.

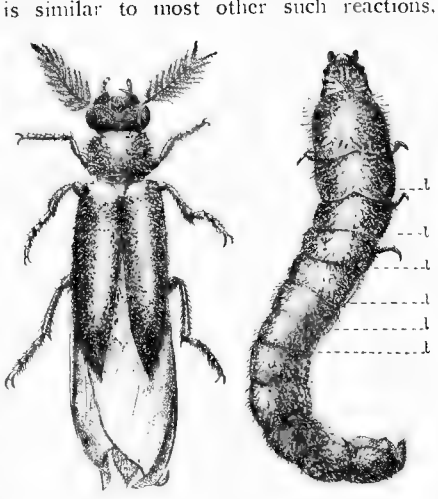
(*Continued from page* 984)

then we have two perfectly reversible reactions, involving oxygen and water, both of which are of prime necessity to the phenomenon of bioluminescence.

It appears then that there is present in the photogenic organ of the fire-fly some chemical substance which undergoes oxidation with the production of light. In 1887 the French chemist Dubois discovered that two substances can be extracted from the luminous organ of the animal, both of which are very essential to the process. Since this discovery other workers have precipitated, purified and experimented with these compounds and we now have a fairly clear idea as to their probable structure and the part they play in bioluminescence. The first of these substances has been named *luciferin,* and it is this material which oxidizes with the evolution of light. In a strict sense, we should speak of *luciferins,* because there are as many such compounds as there are types of luminous animals, and each luciferin is specific for that particular variety of organism. The other substance, termed *luciferase,* is a catalyst or enzyme, which, though taking no apparent part in the reaction, and not itself being consumed or changed, nevertheless materially aids in the process, and is a factor which cannot be dispensed with.

On the chemical structure of these two substances chemists are not quite agreed among themselves. Luciferin is a nitrogenous compound, and in all likelihood possesses a composition and a molecular configuration closely associated with the proteins. Luciferase, also containing nitrogen, is to be classed structurally with the albumins. Although neither of them has as yet been synthesized in the laboratory, there is no doubt that this feat will soon be accomplished. The simpler proteins, to which luciferin and luciferase are both related, are now being synthesized with no great difficulty.

The scientist has a pretty clear conception of the chemistry involved in the actual generation of light. Knowing that the process is one of oxidation, one would naturally be led to the conclusion that it is similar to most other such reactions,



The male of a South American luminous insect species resembles a fly, the female a worm. Luminous areas on the latter are indicated by the letter "l."

with the production of carbon dioxide and water, and the evolution of light and heat. Experiment demonstrates this conclusion to be three-fourths wrong. The most delicate chemical test can detect not a trace of carbon dioxide or water resulting from the processes involved in bioluminescence. Furthermore, the action is accompanied by no heat manifestation whatsoever. This is a truly "cold light," and nearly 100% efficient.

What happens to luciferin when it is oxidized? Considerable research on this phase of the work, conducted particularly by Professor E. Newton Harvey of Princeton University, has disclosed that the oxidation product is a new material which may be termed *oxyluciferin,* following a nomenclature similar to the one used for *hemoglobin,* the red pigment of our blood. Hemoglobin unites with oxygen as the blood passes through the capillaries of the lungs, forming *oxyhemoglobin.* In the various cells of the body the union between the two is broken up, to furnish the necessary oxygen to the living tissues. In fact, the separation may even be made artificially. If oxyhemoglobin is placed under an air pump and all the air is exhausted, it returns to the original hemoglobin. This process is reversible, and will go either one way or the other, depending upon the amount of oxygen present.

In the case of luciferin the action is strikingly analogous to the one just described. With a proper concentration of oxygen the compound is completely converted to oxyluciferin. Then, under certain other conditions a regeneration takes place, and our luciferin is again obtained. The chemist has not yet learned to effect and control this reversible reaction with any great ease, but he believes that in the lowly fire-fly, as well as in all other forms of luminous organisms, the change is accomplished with the utmost facility.

During the momentary flash of the insect, luciferin is being oxidized to oxyluciferin. In between flashes the oxyluciferin is being reduced back to luciferin, to prepare it for the next flash, which process is continuous and reversible, some of each material always being present. The direction of the reaction, whether oxidation or reduction, as well as the velocity of change, are determined by the amount of oxygen present, in turn controlled by the will of the insect.

Can we utilize the secret of the fire-fly to produce practical "cold light?" The problem is a captivating one, and has fired the imagination of many an investigator in this field. The most available and advanced form of light which man is now capable of generating—the incandescent electric light—is only about 2% efficient. That means that, of all the electrical energy expended in producing it, only 2% is converted into useful light rays, while 98% is dissipated in the form of useless heat. The most fundamental principle underlying incandescence is that a tremendously high temperature must first be attained before any light can be given off. On the other hand the luminescence of these light-giving insects and animals consists of nothing but visible light. There is no radiation in the spectrum below the red or above the violet ends. The energy radiated is 100% light and heat.

$3750.00 REWARD

Find the key to unlock this PRIZE Bag of Gold

© 1930 by J. L. Decker

THERE are 19 keys pictured here. To be sure, they all look alike, but, examine them closely. 18 of them are exactly alike, but, **"ONE,"** and only one is DIFFERENT FROM ALL THE OTHERS. It is the key to OPEN THE PADLOCK on this $3,750.00 FREE "Bag of Gold."

SEE IF YOU CAN FIND IT?

Clues The difference may be in the size, the shape, or even in the notches. So, STUDY EACH KEY CAREFULLY and if you can find the **"ONE"** key that is different from all the others SEND THE NUMBER OF IT TO ME AT ONCE. You may become the winner of a Special Buick Sedan or $3,750.00 cash money.—without one cent of cost to you. I will give away ABSOLUTELY FREE,—5 new six-cylinder 4-door Sedans and the winners can have CASH MONEY INSTEAD of the automobiles if they prefer it. 15 BIG PRIZES TO BE GIVEN FREE—totaling $7,500.00 cash.

Win a Special Buick or $3750.00

Choice of this beautiful Special Buick Sedan or $3,750.00 cash. We pay all the freight and tax in full on all the prizes and deliver them anywhere in the U. S. A. This is an AMAZING OPPORTUNITY. No more puzzles to solve. ACT QUICK, and here is why—

$1,750.00 Cash—Extra for Promptness

I will pay $1,750.00 cash money extra JUST FOR PROMPTNESS. In the event of a tie for any of the prizes offered, the full amount of the prize tied for will be awarded to each tying contestant. YOU CAN WIN the Special Buick or—$3,750.00 cash. ANSWER QUICK!

You Cannot Lose Absolutely everyone who takes full advantage of this opportunity will be rewarded. But, hurry,—find the **"ONE"** key that is different from all the others and RUSH THE NUMBER OF IT and your name and address to me TODAY on a postal card or in a letter. And, just say:—**"Key number____is different from all the others",**—please tell me how I can get this magnificent Special Buick Sedan—or—$3,750.00 CASH MONEY without obligation or one penny of cost to me." Absolutely no more puzzles to solve.

G. FORD, Dept. 176, 537 S. Dearborn St., Chicago, Ill.

CAST OFF IN THIS BOAT, AND UNROLL A WIDE, WHITE WAKE

HERE'S a stout boat—this "Old Town." She rides the water like a sea-gull—cuts along like a shark. Never shivers or vibrates—she's built extra-rigid. The heavy, non-leak canvas has no seams to open up, and therefore won't ever need caulking. Ideal for heavy loads, but wonderfully light and well-balanced.

Free catalog shows big, fast, seaworthy, all-wood, outboard family boats; canvas-covered, square-stern boats with sponsons; rowboats; dinghies; speedy step-planes; and all types of canoes. Write. Old Town Canoe Co., 1143 Main Street, Old Town, Maine.

"Old Town Boats"

This INVENTION PAID $1,000,000

Housewives welcomed automatic thermostatic control on electric iron. Inventor made fortune. Wealth awaits *you, too,* if you *concentrate* on things that are NEEDED. To make *your* invention PAY BIG get Raymond Yates's new book

"1000 NEEDED INVENTIONS"

Costs only $1.50 and directs your "inventive knack" along right lines. Find out what is *practical* and *needed* by industry and public. Book tells what inventions are wanted in fields of Radio, automotive, etc. Send no money. Write postal. When book arrives, pay mail man $1.50 plus postage. Money back, if desired. Limited offer. Write TODAY and prepare for *real profits.* (Outside U. S. $1.70 cash with order.)
BUREAU OF INVENTIVE SCIENCE, 73 Wisner Building, Rochester, N. Y.

Electrical Engineering Course for men of ambition and limited time. Over 5000 men trained. Condensed course in Theoretical and Practical Electrical Engineering including the closely related subjects of Mathematics and Mechanical Drawing. Students construct motors, install wiring, test electrical machinery. Course designed to be completed in *one college year.*

BLISS ELECTRICAL SCHOOL
Prepare for your profession in the most interesting city in the world. Catalog on request.
163 Takoma Ave., Washington, D.C.

MODEL AIRPLANE BUILDERS
2 Ft. Sikorsky—Amphibian constr. set, $2.75.
2 Ft. Savoia—Marchetti constr. set, $2.50.
2 Ft. Curtiss—Army Hawk constr. set, $3.00.
Blueprints only, all full size 50c per piece. 3 Ft. Lockheed-Vega constr. set, $5.25. 2 Ft. Merrow-Twin—Bomber (Drops 5 bombs while in flight) constr. set, $1.50.
32-Page Catalog 5 cents
NATIONAL MODEL AIRCRAFT and SUPPLY CO.
29 North Ave. Dept. S New Rochelle, N. Y.

No Wind Can Blow It Out

I'LL PAY YOU $20 A DAY

Showing My Mystery Lighter to Men. What Makes It Light? All Guaranteed. Sample With Sales Plan 25c. Sample Gold or Silver Plated, $1.00. Agents write for proposition.
NEW METHOD MFG. CO.
Desk S. I. 3 Bradford, Pa.

Aladdin's Lamp in the Laundry

By Mrs. Christine Frederick

(*Continued from page* 998)

modern machinery and chemicals, is not widely understood. Here are four points to sum up:

1. It is not necessary to soak clothes because wet pieces weaken the suds solution, and long soaking lowers the temperature and contracts the grease in the fibres. If you feel that certain very soiled pieces need soaking, place them in machine with lukewarm water and a small quantity of powdered soap. Operate machine 2 minutes. Never allow them to soak over 3 hours, and soak clothes preferably in a machine, for soaking in a set tub, then removing to a machine, etc., is unnecessary handling. Drain off water and wash.

2. It is not necessary to boil the clothes because the scald-rinse in the machine takes its place. It accomplishes the sterilization and bleaching far better and with less labor. It reaches every part of the clothes in a way which cannot be done in a boiler, with the clothes tightly packed, and no agitation of the water. A few articles, as sanitary cloths, baby napkins, etc., may need occasional boiling.

3. It is possible to both wash and wring at the same time, owing to the swinging wringer. With a little practice you will find that you can wring any previous load while a later one is washing. You may wring from the washer to a set tub, or from a set tub to a basket, or in any combination. Nor do you have to stand in one uncomfortable position all the time; you may swing the wringer and work where you choose.

4. It is possible to blue by machine more satisfactorily than can be done by hand. To do this, wring all loads from their scald-rinse into empty tub or basket. Drain machine, add clear, cool water and the desired quantity of bluing. Add pieces and operate machine 3 to 5 minutes; wring.

I would suggest a definite schedule of washings for efficiency which is far better than the hit-and-miss, higgledy-piggledy way which many housewives use. I arrange the loads in sequence, as follows:

Load 1 (White)—Sheets, cases, face towels, doilies, hard-finish white goods. Water 120 degrees; 1 cup combination soap-soda solution to each load; operate 10 to 15 minutes; scald-rinse (150 degrees) 5 minutes; blue-rinse (90 degrees) 3 to 5 minutes.

Load 2 (White)—Tablecloths, napkins, shirtwaists, brassieres, cambric night or underwear, child's dresses, white petticoats, aprons, handkerchiefs, moderate hard-finish goods. Water 120 degrees; 1 cup combination soap-soda solution to each load; operate 10 to 15 minutes; scald-rinse (150 degrees) 5 minutes, blue-rinse (90 degrees) 3 to 5 minutes.

Load 3 (White)—Cotton or mixed underwear, bath towels, kitchen towels, bedspreads, covers, nightwear, cotton crepes, all coarse meshed goods. Water 120 degrees; 1 cup combination soap-soda solution to each load; operate 12 to 18 minutes; scald-rinse (150 degrees) 5 to 8 minutes; blue-rinse (90 degrees 3 to 5 minutes.

Load 4 (Flannel)—Night garments or underwear of flannel or outing flannel, petticoats, shirts, small quilts, children's woolen articles, blankets, all flannel finish or partly wool goods. Water 110 degrees; 1 to 2 cups white soap solution to each load; operate 8 to 10 minutes; clear-rinse (110 degrees) 5 to 8 minutes.

Load 5 (Colored)—House dresses, men's shirts, rompers, child's dresses, aprons, all colored or partly colored goods of gingham, chambray, linen, etc. Water 110 degrees; ½ to 1 cup white-soap solution to each load; operate 10 to 15 minutes; clear-rinse (110 degrees) 5 minutes.

If women would attack their laundry problems with the principles of system and scientific management used in business, the same thing would happen in the home—there would be more work done with less labor and time. Nowadays no woman need "break her back" over the washtubs, or even get very tired doing the family laundry.

Nineteen Hundred Corporation

Presto! Your garments fly from wringer to ironer in ten seconds.

MODEL BLUEPRINTS

Correct—Easy to Follow

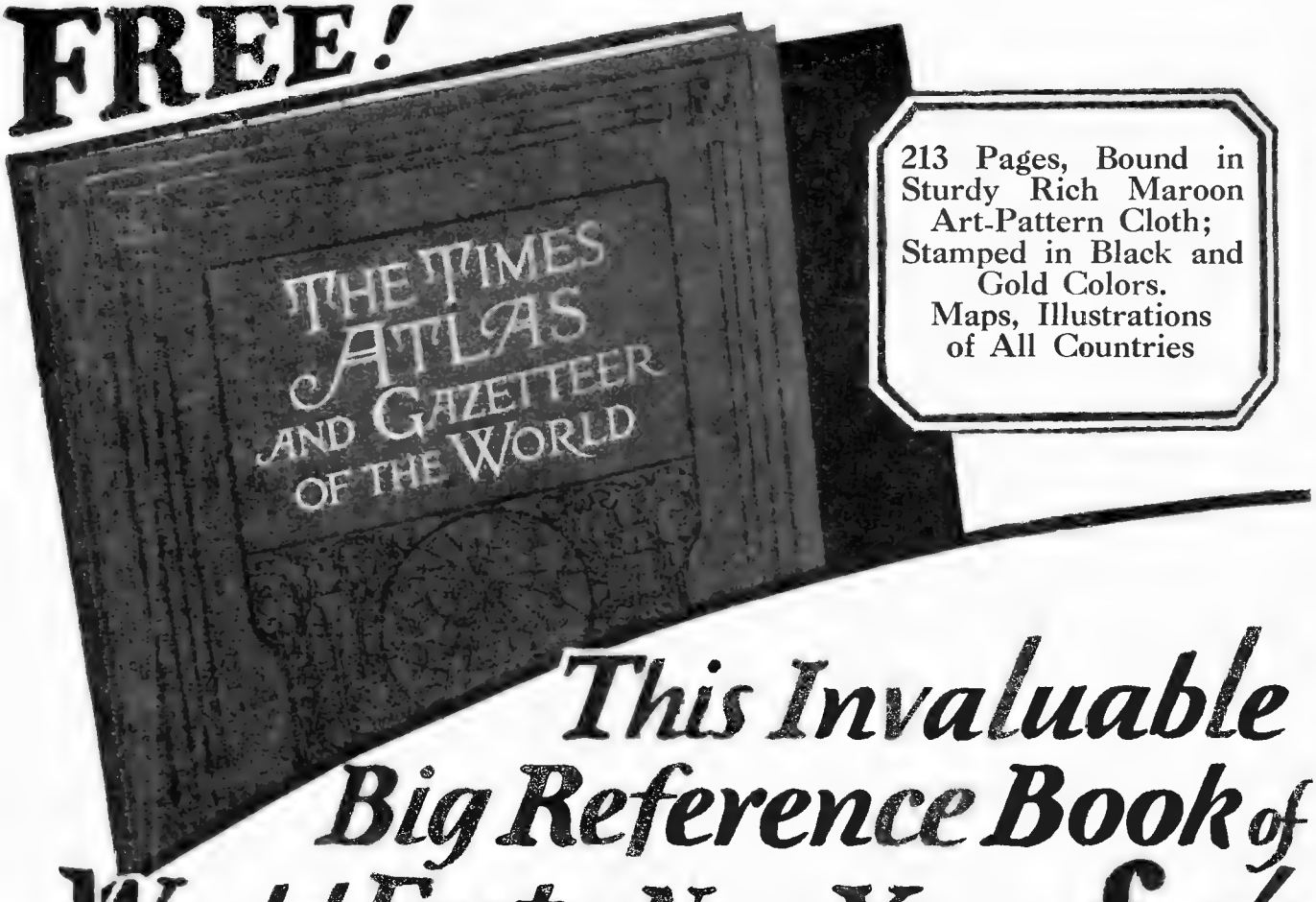
1-2	Horizontal Steam Engine details..set	$1.00	23-24	Model U. S. S. Portsmouth.....set	$1.00
3-4	Boiler construction for above....set	1.00	25	Building a Model Tugboat.....	.50
5	880-Ton Bark	.50	26	Twin Cylinder Marine Engine.....	.50
6-7	Twin Cylinder Steam Engine and Boiler .....set	1.00	27-31	U. S. S. Truxton.....	2.00
8-9	Gasoline Fired Locomotive.....set	2.00	32	Sopwith Biplane	.50
10-11	U. S. S. Constitution, "Old Ironsides" .....set	1.00	33	Speed Boat	.50
12	13th Century Man-of-War	.50	34	Airplane Engine	.50
13-14	Chinese Junk .....set	.50	35-36	Motor Winch	.75
15-16	Electrically Driven Automobile..set	1.00	37-38	Vertical Steam Engine.....	1.00
17	Roman Ballista	.50	39	Cannon	.50
18-19	Simple Steam Engine .....set	.50	40	Steam Roller	.50
20-21	How to Build a Reflecting Telescope.	1.00	41	Prairie Schooner	.50
22	"Santa Maria," complete.....	.50		Lincoln Sport Biplane (man-carrying)	6.75
				Gerber Monoplane (man-carrying)..	1.00

Anyone who can read blueprints and is at all handy with tools, will find no difficulty in following the simple explanatory diagrams. Many sport planes and monoplanes built from our plans are flying daily, thus attesting to the accuracy of the blueprint details. Satisfaction guaranteed.

Send Orders to

BLUEPRINT DEPARTMENT, SCIENCE AND INVENTION
381 FOURTH AVENUE, NEW YORK CITY

FREE!



213 Pages, Bound in Sturdy Rich Maroon Art-Pattern Cloth; Stamped in Black and Gold Colors. Maps, Illustrations of All Countries

This Invaluable Big Reference Book of World Facts—Now Yours free!

PROBABLY no single volume, with the exception of the Bible, is more essential to every home and business than a *new, up-to-date, complete* Atlas and Gazetteer of the World. The thousands of *recent* changes and new developments in transportation, cities, governments, roads, explorations, industries, etc., make old Atlases obsolete and practically useless.

That is why SCIENCE & INVENTION, taking pride in keeping its readers posted on every vital development the world over, has made a fortunate arrangement to give you FREE a new, enlarged, complete, latest edition copy of the famous Times Atlas and Gazetteer of the World.

ATLAS AND ENCYCLOPEDIA COMBINED

Hundreds of thousands of helpful, important facts are brought to you within its covers. For, you see, it is really two big books bound into one. The first part of this huge volume is a complete world atlas, with large legible maps in color of every state, country and tiny island on this great globe. The latter part of the book contains a description of each country, its government, commerce and industry; its communication systems, principal towns, etc. And all this great fund of information is illustrated profusely with numerous photographs from these countries.

FREE—A GIFT FROM US

To get this invaluable big book absolutely FREE and postpaid by return mail, all we ask is that you signify your intention of subscribing to thirty months of SCIENCE & INVENTION for only six dollars. (Regular newsstand price is seven dollars and a half.)

But send no money! Examine The Times Atlas and Gazetteer first at our expense, and then if you are satisfied, *and only then*, will we bill you (in easy installments) for your subscription to SCIENCE & INVENTION, and the big book becomes a gift to you with our compliments.

Requests for The Times Atlas and Gazetteer have been coming in so fast since we first made this unusual offer, that you must clip and mail the coupon at once. Our stock of books is limited, and we cannot guarantee your getting this exceptional atlas and encyclopedia unless you send for a copy immediately.

Send No Money—Mail Coupon Today!

SCIENCE & INVENTION, Dept. 2503-Q,
381 Fourth Avenue, New York, N. Y. **(FREE)**

Gentlemen:

Please send me postpaid, and Absolutely FREE, "The Times Atlas and Gazetteer," and enter my subscription to the next fifteen months of SCIENCE & INVENTION Magazine at your special rate of six dollars (saving me one dollar and fifty cents on the regular newsstand price), payable when billed later, in easy installments of two dollars each month for three months. If, after five days' examination, I am not perfectly satisfied with "The Times Atlas and Gazetteer," I understand that I can return it and owe you nothing.

Name .....

Address .....

City ..... State .....

Read Classified Advertising——It Pays!!!

Advertisements in this section fifteen cents a word for each insertion. Name and address must be included at this rate. Cash should accompany all advertisements unless placed by an accredited advertising agency. Not less than 10 words accepted. Objectionable or misleading advertisements not accepted. Advertisements for these columns should reach us not later than 1st of 2nd month preceding issue.

Classified Advertising Manager—Experimenter Publications, Inc., 381 Fourth Avenue, New York City

Advertising

Get into Advertising. Learn quickly at home. Experience unnecessary. New, easy plan. No text-books used. Practical work. Old established school. Send name and address for interesting free booklet. Page-Davis School of Advertising, Dept. 533-A, 3601 Michigan, Chicago.

Agents Wanted

Succeed With Your Own Products. Make them yourself. Formulas, Processes, Trade Secrets, all lines. Catalog free. D. Thavly Co., Washington, D. C.

Strange new electric iron cord! Prevents scorching. Saves electricity. Cannot kink or snarl. For telephones also. Up to $25 daily. Samples furnished. Neverknot, Dept. 3-K, 4503 Ravenswood, Chicago.

Don't sell for others—Employ agents yourself. Make your own products. Toilet articles, household specialties, etc. 500% profit. Valuable book free. National Scientific Laboratories, 1932W Broad, Richmond, Virginia.

Just put our Chewing Gum outfit in your Pocket. Make daily expenses. Sell to stores. Popular Flavors. Outfit furnished. Helmet Corp., Dept. 56, Cincinnati, O.

Salesmen—1000 Car Washings for $3.75. Remarkable invention washes cars faster, cleaner, cheaper. 100% profit for agents. Write today for Free Sample Offer. Gy-ro Brush, Dept. C-24, Ampere, N. J.

Free Booklet describes 67 Plans for making $20 $100 weekly in home, or office Business of your own. Elite Co., 84-B, Elizabeth St., N. Y.

42 Miles on 1 Gallon of Gas—Wonderful new Vapor Moisture Humidifier and Carbon Eliminator. All autos. 1 furnished to test. Critchlow, Inventor, 863N, Wheaton, Ill.

Amazing Profits Showing Rayon Bedspreads; Linenlike Tablecloths. Wash like Oilcloth. Samples free. Bestever Co., 147 Irving Park Station, Chicago.

$10 daily silvering mirrors, plating and refinishing lamps, reflectors, autos, beds, chandeliers by new method. Outfits furnished. Write Gunmetal Co., Ave. D, Decatur, Ill.

Agents—Men, earn up to $12 daily wearing fine Felt Hats and showing friends. Smartest styles. Latest shades. $2 to $5 saving on every hat. Samples FREE. Taylor Hat and Cap Mfrs., Dept. CC-390, Cincinnati, Ohio.

Agents—Big Chance to Earn $15 to $25 daily, introducing new, patented, safety, Automatic Burglar Proof Ventilating Window Lock for homes, stores, offices, banks, all buildings. Sensational seller. Anyone, even without experience, should make 3 to 10 sales in single call. Nothing else like it—No competition. Write quick for terms — territory. Elmwood Mfg. Company, 1003 Elmwood Place, Cincinnati, Ohio.

Men Wanted—To demonstrate and take orders direct from motorists. Amazing Magnetic Trouble Light. Sticks on metallic surfaces. Our men earn as high as $75.00 weekly. Write for demonstrator. Magno, Beacon Bldg., Dept. 491, Boston Mass.

400% PROFIT—New Imported Novelties. Many lines repeaters. Costs $1.00, sells $12.00. Useful samples and particulars 25c. Northwestern Company, AS-543 North Ashland, Chicago

Big money and fast sales. Every owner buys gold initials for his auto. You charge $1.50; make $1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 71, East Orange, N. J.

QUIT WISHING FOR BIG MONEY! I'll show you a simple, easy way to make $200, $500 $1000 or more. Wonderful new proposition. Albert Mills, 4998 Monmouth, Cincinnati, O

$60-$200 a week. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 441 B, North Clark, Chicago.

500 Formulas and Big Illustrated Catalog 25c. Ideal Book Shop, Park Ridge, Ill.

Make your own products. Employ agents yourself. Toilet articles, soap extracts. We furnish everything. Valuable book Free. National Scientific Laboratories, 1932W Broad, Richmond Va.

Gold Leaf Window Letters and Script Signs; no experience; 500% profit; samples free. Consolidated, 69-R, West Van Buren, Chicago.

Airplanes—Aviation

Biggest, Best Catalog Model Airplanes, Parts, Supplies; 5c postpaid. Ideal Company, 23 West 18th Street, New York.

Model Aeroplane supplies. Write for free bundle of sample stock. Aero Shop, 3050 Hurlbut Ave., Detroit, Mich.

Business Opportunities

Screw-holding screw driver! Amazing new invention. Factories, garage, electricians, auto, radio owners buy on sight. Removes and inserts screws instantly inaccessible places. Sells $1.50. Investment for merchandise only. Exclusive territory. Write quick for trial offer. Tooleo, 1515 Windhop Bldg., Boston.

Amateur Cartoonists: Sell Your Cartoons New Plan. Smith's Service, Ex. 1191, Wenatchee, Wash.

Free Book. Start little mail order business. Hadwil, 5A-74 Cortlandt Street, New York.

Sell by Mail!—Books, Novelties, Bargains! Large Profits! Particulars Free. E—Elfco, 525 South Dearborn, Chicago.

BIG MONEY AWAITS YOU HERE. 250 Signs and pictures an hour without press, type or machinery. Samples and particulars 10c. Straco, 1015 Mulberry, Springfield, Ohio.

Chalk Talks

Laugh-Producing Program, $1.00 Catalog 10c Balda Art Service, Dept. 4, Oshkosh, Wis.

Chemistry

Complete Chemical Laboratory Equipment for Experimenter. Circular Free. Experimental Service Laboratory, Hoosick Falls, N. Y.

CHEMICAL EXPERIMENTS—25 interesting experiments and useful formulas 25c. Recipe for silver-plating included. J. Papandieu, 2537 No. 73rd Ct., Elmwood Pk., Ill.

Your Chemical problems solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Correspondence Courses

Used correspondence school courses sold on repurchase basis. Also rented and exchanged. Money-back guarantee. Catalog free. (Courses bought). Lee Mountain, Pisgah Alabama.

Detective

Detectives. Work home or travel. Experience unnecessary. Particulars free. Write George Wagner, 2190 Broadway, New York.

Farm Lands

Wanted to hear from owner having good farm for sale. Cash Price, particulars. John Black, Chippowa Falls, Wisc.

For Inventors

Inventors, use our special service for presenting your inventions or patent to manufacturers. Adam Fisher Mfg. Co., 205-A Enright, St. Louis, Mo.

FREE BOOKLET ON PATENTING New inventions. Sterling Buck, S-629-F, Washington, D. C.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars. (Copyrighted.) Write W. T. Greene, 908 Barrister Bldg., Washington, D. C.

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Formulas

Formulas—all kinds. Catalog free. Clover Laboratories (T.), Park Ridge, Ill.

Help Wanted—Instruction

WORK FOR "UNCLE SAM." $105.00-$280.00 month. Life Jobs. Steady work. Men—Women, 18-50. Thousands 1930 appointments. Many examinations coming. Common education usually sufficient. Experience unnecessary. List positions and full particulars—FREE. Write today sure. Franklin Institute, Dept. G4, Rochester, N. Y.

Wanted Immediately. Men-Women, 18-55, qualify for permanent Government Positions. $105 $250 month; experience not required; Vacation with pay; common education; many needed soon. Write, Instruction Bureau, 293, St. Louis, Mo., quickly.

RAILWAY POSTAL CLERKS, $158.00-$225.00 month. Steady. Spring examinations likely. Common education sufficient. Men 18-35. Particulars free. Write immediately. Franklin Institute, Dept. G 15, Rochester N. Y.

How to Entertain

Plays, Musical comedies and revues, minstrels, comedy and talking songs, blackface skit, vaudeville acts, monologs, dialogs, recitation, entertainments, juvenile plays and songs, musical readings, make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 99, Chicago.

Insects Wanted

Cash paid for butterflies, insects. See Sinclair's Advertisement on page 1040.

Invention Buyers

LISTEN! LISTEN! LISTEN! Invention Buyers. Investors. Backers, Aeroplane Mfg., Airport, Airways, Automobile, and Bus Owners and Managers. Finish Models to open Inventions for Sale Reasonable. Advancement and Royalty expected. E. W. Mills, Tel. Jerome 6865. Office hours: 8 A. M.—11 A. M.; 8 P. M.—11 P. M. 1357 Webster Ave., New York.

Inventions Wanted

Inventions Wanted—patented, unpatented. If you have an idea for sale write, Hartley, Box 928, Bangor, Maine

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Magic

Magic Catalog 20c. Lynn's, 105 Beach, Dept. 6, Jersey City, N. J.

Male Help Wanted

Firemen, Brakemen, Baggagemen (white or colored), Sleeping Car Train Porters (colored), $150-$250 monthly. Experience unnecessary. 897 Railway Bureau, East St. Louis, Ill

BE AN INVESTIGATOR. Make secret investigations, work home territory. If you have natural ability and a desire for the work, experience is unnecessary. Write today for particulars. Northern Detective & Identification Bureau, Dept J, Traverse City, Michigan

Manufacturing

TO ORDER—Complete service in the mechanical line. Models, high grade experimenting, production. PARMA Engineering Works, Cleveland, Ohio.

Manufacturing, Dies, Tools, Brass Work, Models, Inventions. Baum's Metal Specialties, Kansas City, Mo.

Miscellaneous

MAKE ELECTRICAL WATER HEATer. Fits standard tanks. Inexpensive. $1.00. Deckelman 3832, Wilmington, St. Louis, Mo.

Agents, Canvassers, Salesmen, Merchants, etc., who are seeking direct contact with manufacturers for live propositions; 100% satisfaction guaranteed; send me 25c (coin or stamps) for one pound of direct contact literature of over 200 unexcelled offers. Ted Armour, 136 East 28th Street, New York, N. Y.

Equip your phonograph with a recording instrument. Makes and plays back records of voice, musical instruments or radio immediately. Easy to install. No skill required. Send for complete details. Talk Back Recorder Company, Dept. S, 315 West Ninth Street, Los Angeles, California.

Patents

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co. 205 Enright, St. Louis, Mo

Patent Attorneys

Registered Patent Attorney-Engineer. Expert in Chemical, Mechanical, and Electrical Patent Matters. Former Examiner. Correspondence invited. A. Ponack, 401 Homer Bldg., Washington, D. C.

Patents. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free book, "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from patent office), Washington, D. C. See page 1031

Patents—Write for Free Instructions. Send drawing or Models for Examination. Carl Miller, Registered Patent Attorney (former Patent office examiner), 258 McGill Building, Washington D. C.

Patent Sense. As one of the oldest firms in America we give inventors, at lowest consistent charge, a service noted for results, evidenced by many well-known patents of extraordinary value. Book, Patent-sense, free. Lacey & Lacey, 614 F Street, Washington, D. C., Estab. 1869.

Patent Attorneys (Cont.)

Patents Procured; Trade-Marks Registered—Preliminary advice furnished without charge. Booklet and form for disclosing idea free. Irving L. McCathran, 703 International Building, Washington, D. C.

"Inventor's Adviser," Valuable Patent-book sent free. Labiner, 15 Park Row, New York.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Lederman, Registered Attorney and Engineer, 233 Broadway, New York City.

JAPAN; Yoshijiro Nakane, Registered Patent Attorney. 24, Ishigatsujicho, Tennujiku, Osaka.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars. (Copyrighted.) Write W. T. Greene, 909 Barrister Bldg., Washington, D. C.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, free schedule, information free. Lancaster, Allwine & Rommel Registered Patent Attorneys in the United States and Canada, 242 Ouray Building, Washington, D. C.

Patents or Inventions

Inventions Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Photoplays Wanted

$$$ Photoplay Ideas For Both Silent and Talking Pictures. Accepted any form for revision, criticism and submission to studios. Estab. 1917. Booklet free. Universal Scenario Co., 223 Western & Santa Monica Bldg., Hollywood, Calif.

Pocket Radios

GUARANTEED POCKET RADIO, $2, Particulars Free. Neil Tasker, Sixth Street, Shamokin, Penna.

Printing Outfits and Supplies

Print Your Own cards, stationery, circulars, advertising, etc. Junior press, $5.90; job presses, $11; rotary, $149. Print for others; big profit. Easy rules furnished. Write for catalog presses, type, paper, etc. Kelsey Company, Q-6, Meriden, Conn.

Real Estate

PECAN. Orange-Fig groves "On the Gulf." Monthly payments. Guaranteed care. Big quick returns. Suburban Orchards, Dept. S., Biloxi, Miss.

Salesmen Wanted

$282.80 Commission possible on a $25.00 original sale. Every merchant a prospect. Absolutely new and different. Exclusive territory. Sales Stimulators, 339 W. Madison, Chicago.

42 MILES ON 1 GALLON OF GAS—Wonderful New Vapor Moisture Humidifier and Carbon Eliminator. All autos. 1 furnished to test. Critchlow, Inventor, 863-0, Wheaton, Ill.

Punchboard Salesmen. $10,000 Yearly, New Line. All fast sellers. Lowest prices. Full commission on repeat business. Catalog Free. Hurry! Puritan Novelty Co., 1409 Jackson, Chicago, Ill.

Punchboards—Hottest, largest money-making line ever offered. Season starting. Best commissions. Nothing to carry. Catalog FREE. Act! M & L Sales, 301 W. Adams, Chicago.

Songwriters

COMPOSERS—Verse or Music. Brilliant opportunity. Write Van Buren, 1942 McClurg Bldg., Chicago.

Songwriters—substantial advance royalties are paid on publisher's acceptance. New Booklet, "Song Requirements of Talking Pictures," sent free. Newcomer Associates, 793 Earl Bldg., New York.

Free! Song Writers' Guide. Beaver, D-24, 1257 Elm, Green Bay, Wis.

Telegraphy

Learn Morse and wireless telegraphy. Big salaries. Tremendous demand. Expenses low, can earn part. Catalog free. Dodge's Institute, Stone Street, Valparaiso, Indiana.

War Relics

German Iron Cross, $3.00; Bohemian War Cross. 90c; World War Medal list 10c. Dare, 670 E. 42nd, Brooklyn, N. Y.

Diagnosing Securities

By Alfred M. Caddell

Financial Editor

TO most people, discovering a clue to the trend of security values is like searching for a needle in a haystack or finding the beginning of a circle. Yet most definite clues exist and are easily recognized by those skilled in diagnosing the underlying causes which show up as effects in the market quotations.

When a young man desires to become a physician he goes to a seat of learning where the knowledge pertaining to the body and kindred subjects is imparted and after years of conscientious practice he may become skilled in his calling. The same is true of dentistry, architecture, building construction and every other calling which is above manual labor. So most assuredly, the man or woman who would make money with money, whether for brief or long periods, should necessarily be well grounded in the subject of finance.

As in the medical field, a correct diagnosis of a security's value and trend constitutes nine-tenths of the problem of "what to do." With the application of the other tenth—money and courage—a complete success is brought about; contrariwise, all the money at one's disposal, invested unintelligently and at the wrong time, can only mean disaster.

Time is the essence of financial success in the business of making money with money, for inopportune investment of capital may very quickly work itself into a liability instead of an asset.

In a sense, while the maintenance and rise in values have their bases in a widespread national and international prosperity, which, of course, is never equalized throughout the world, a correct diagnosis of any security's value can only be ascertained *via* a concentrated analysis in any particular field. Public utilities, railroads, communications, entertainment, automobiles, chain-store or mail order merchandising and similar businesses furnish indices by which the earning power of industrial specialties may be measured.

For instance, when the public utilities are booming, the various companies are in an expansive mood, which means electrical and machinery equipment purchases, copper wire, conduits and so forth. When the railroads are going ahead under full steam, new equipment of every sort means earnings to companies specializing in those fields. The growing public's consciousness of the benefits and commercial possibilities of electrical communication is steadily expanding and unquestionably will show continually mounting values well into another generation and possibly beyond that. Entertainment, like food, is a pretty nearly stable commodity, subject more or less to slow changes of fashion. The present-day automobile industry, while representing a popular and now necessary vehicle of transportation, has its basis largely in installment buying.

This, in turn, rests on the steady earning power of millions of people; and the automobile, long since having become a pivot industry, likewise affects, either favorably or adversely, the steel, aluminum, copper, rubber, plate glass, oil and innumerable other businesses. For instance, one fifth of the entire steel output of the country goes into the manufacture of automobiles. Chain-stores and mail-order houses still effect changes in our retail business structure, and specialties of various kinds are in turn affected. What the development of the rayon business has done to the established silk, cotton and woolen industries and what the development of other chemical products has done to the lumber, furniture and other fields is too well known to require further comment.

The whole subject of investing is indeed an interesting and a scientific one to analyze. To approach the business without having given it the necessary deep study simply means that one is gambling and gambling is the poorest business on earth, for one may speedily lose his entire capital and receive nothing but heartaches. To approach it with due regard means success in proportion to the study, courage and money applied. The payment of nearly $6,000,000,000 by American industry to American and foreign investors in the year 1929—the largest payment in our history—is the proof that there is money to be made in the wise selection of securities.

Questions and Answers

Conducted by Alfred M. Caddell

Financial Editor

Information on securities will be furnished readers of "Science and Invention" free of charge by mail and through these columns. A 2-cent stamped, self-addressed envelope should be included in your letter. Address your inquiries to the Financial Editor, Science and Invention, 381 Fourth Ave., New York City.

Question—I note that American Telephone & Telegraph has had a good year in 1929. Are the prospects favorable for continued expansion of this company? H. L. K., Hoboken, N. J.

Answer—By all measurements of an industry's prospects, A. T. & T.'s growth may be considered to be indefinite. The company has been a consistent dividend earner for many years and is near the $4,000,000,000 mark in valuation. The company's earnings will approximate $12.50 per share for the year 1929, as against $12.11 for 1928. Earnings for 1928 were on an average of 11,823,745 shares outstanding, whereas the average for 1929 was about 14,000,000. The A. T. & T. system links 29,000,000 telephones, and connections have recently been established with 9,000,000 telephones in foreign countries. The company is expected to issue rights to subscribe to more stock, and contemplates spending $700,000,000 in 1930 for further expansion.

Question—Can you tell me anything about the Intercontinental Aircraft Corporation? R. L. M., Muskegon, Mich.

Answer—I never heard of this corporation and can find no record in the financial manuals regarding it. Undoubtedly it is a local company. However, would suggest that you watch your step when you are asked to put money into a new company. Aside from the fact that there are too many companies already in aviation, the most of which have no chance to succeed, a great deal depends on management and the make-up of the directorate. Poor management will wreck the very best of business prospects.

Question—I own 100 shares of Montgomery Ward and have been quite anxious regarding this stock. They say that the company is having a lot of trouble with its chain of retail stores. B. F. G., Clinton, Iowa.

Answer—As in all new enterprises it takes time to iron out the kinks that develop, but to infer that Montgomery Ward is unduly suffering from this cause is entirely erroneous, and we fear is propaganda put out to depress the value of this security, and for that purpose only. There is hardly any doubt as to the stability of this company. The year 1929 not only developed a record sales volume, far exceeding any previous total, but also vastly strengthened the company's basic position in the merchandising field. Two new mail-order headquarters, at Denver, Col., and Albany, N. Y., were opened during the year, giving the company a total of nine strategically located distribution points. Over 250 new retail stores were added to the chain, making a total of 550 retail outlets, adding approximately 1,000,000 customers to the company's list.

Health Means SUCCESS

Health pays best. No other quality equals it. It is the power behind Cheerfulness—the magnet that attracts influence and friends.

Nobody wants to be a grouch, but a lot of fine fellows become known as grouches just because they can't be cheerful. You can't be cheerful if you aren't well but

You Can Be Healthy

if you will just stop worrying long enough to find out how easy and simple it really is. You may have no clearly defined ailment but you don't feel peppy and aggressive. You'd rather sit than stand. That's a bad sign. You'd rather ride than walk. That's bad too. I find lots of fellows like this. Never occurred to you to

Strongfort Builds Health

Let Nature Build You Up

did it? No Pills. No Tonics. Just start Mother Nature on the right road and let her alone. Then what Nature will do to build up your Health and Physique is beyond even the imagination of most men. But I KNOW. I've seen her do wonders, over and over again. I've seen her build Health—ebullient, roseate health in bodies that seemed hopeless.

I Don't Care Where You Live

or who you are, or what you do, if you aren't healthy, vigorous and ambitious my book will be a revelation to you. Here are 64 amazing pages telling how Nature rebuilds bodies for men who have neglected or mistreated theirs. Here's a chance to check up on yourself. Find out whether you are all man, or just part man. GET THIS BOOK TODAY. No charge. Just fill in the coupon. If some doctor has you scared, ask for a leaflet on the Ailment he says you have. Learn what it is.

LIONEL STRONGFORT
PHYSICAL AND HEALTH SPECIALIST
FOR OVER 30 YEARS
Dept. 30, Newark, New Jersey, U.S.A.

—Fill in this Coupon Now—

LIONEL STRONGFORT, Dept. 30, Newark, N. J.

Please send me "Life's Energy Through Strongfortism," without cost or obligation. I have marked (X) before the subjects in which I am interested.

...Acne	...Manhood Restored
...Arthritis	...Nervousness
...Asthma	...Neuralgia
...Biliousness	...Neurasthenia
...Blackheads	...Neuritis
...Body Odors	...Night Losses
...Bronchitis	...Obesity
...Catarrh	...Pimples
...Colds	...Poor Circulation
...Constipation	...Poor Memory
...Despondency	...Rheumatism
...Dizzy Spells	...Round Shoulders
...Fallen Arches	...Rupture
...Falling Hair	...Short Breath
...Flat Chest	...Sinus Trouble
...Gastritis	...Skin Disorders
...Halitosis	...Stomach Disorders
...Hay Fever	...Stoop Shoulders
...Headache	...Tonsillitis
...Heart Weakness	...Torpid Liver
...High Blood Pressure	...Underweight
...Impotency	...Vital Losses
...Increased Height	...Wandering Mind
...Indigestion	...Weak Back
...Insomnia	...Weak Eyes
...Kidney Trouble	...Weakness (Specify)
...Lumbago	...Great Strength
...Lung Trouble	...Muscular Development

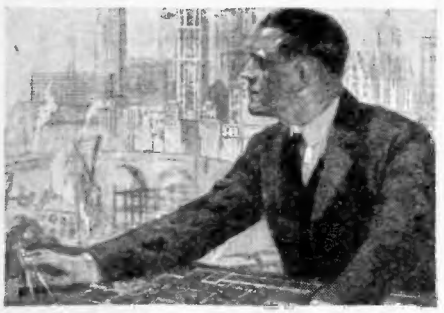
Private Ailments .....

Name .....

Age ..... Occupation.....

Street .....

City ..... State.....



Former Plasterer Now Earning $12,000 a Year

"When I enrolled with the International Correspondence Schools, I was a plasterer and I didn't know a thing about blueprints. Today I have my own contracting business and I am able to figure the most difficult jobs and execute them to the satisfaction of everyone concerned. My income is between $12,000 and $15,000 a year. It certainly was a lucky day for me when I sent in that I. C. S. coupon."

That's a true story of what just one student of the International Correspondence Schools has done. Every mail brings letters from other ambitious men and women telling of promotions and increases in salary due directly to spare-time study.

One hour a day spent with the I. C. S., in the quiet of your own home, will prepare you for success in the work you like best.

Mail coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 6211-F, Scranton, Penna.

Without cost or obligation on my part, please send me a copy of your 48-page booklet, **"Who Wins and Why,"** and tell me how I can qualify for the position, or in the subject, *before* which I have marked an X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Work
☐ Architectural Draftsman	☐ Aviation Engines
☐ Building Foreman	☐ Plumber and Steam Fitter
☐ Concrete Builder	☐ Plumbing Inspector
☐ Contractor and Builder	☐ Foreman Plumber
☐ Structural Draftsman	☐ Heating and Ventilation
☐ Structural Engineer	☐ Sheet-Metal Worker
☐ Electrical Engineer	☐ Steam Engineer
☐ Electrical Contractor	☐ Marine Engineer
☐ Electric Wiring	☐ Refrigeration Engineer
☐ Electric Lighting	☐ R. R. Positions
☐ Electric Car Running	☐ Highway Engineer
☐ Telegraph Engineer	☐ Chemistry
☐ Telephone Work	☐ Pharmacy
☐ Mechanical Engineer	☐ Coal Mining Engineer
☐ Mechanical Draftsman	☐ Navigation ☐ Assayer
☐ Machine Shop Practice	☐ Iron and Steel Worker
☐ Toolmaker	☐ Textile Overseer or Supt.
☐ Patternmaker	☐ Cotton Manufacturing
☐ Civil Engineer	☐ Woolen Manufacturing
☐ Surveying and Mapping	☐ Agriculture ☐ Fruit Growing
☐ Bridge Engineer	☐ Poultry Farming
☐ Gas Engine Operating	☐ Mathematics ☐ Radio

BUSINESS TRAINING COURSES

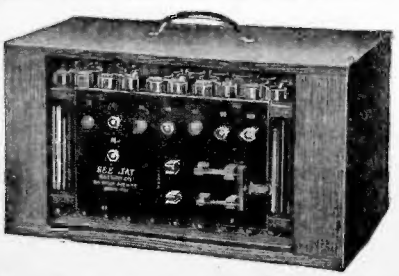
☐ Business Management	☐ Business Correspondence
☐ Industrial Management	☐ Show Card and Sign Lettering
☐ Personnel Management	☐ Stenography and Typing
☐ Traffic Management	☐ English
☐ Accounting and C. P. A. Coaching	☐ Civil Service
☐ Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Mail Carrier
☐ Secretarial Work	☐ Grade School Subjects
☐ Spanish ☐ French	☐ High School Subjects
☐ Salesmanship	☐ Illustrating ☐ Cartooning
☐ Advertising	☐ Lumber Dealer

Name.....
Street
Address.....
City.....State.....
Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

"Dependable 'B' Battery Power"

For long and short wave receivers. Prices reasonable. Also batteries, A & B operating from 32 to 110 volt farm lighting systems.



Write for our free interesting booklet. **See Jay Battery Co., 911 Brook Ave., N. Y. C.**

INDEX TO ADVERTISERS

	Page
A	
Advance Electric Co.	1051
Alderton, G. W.	1046
American School	1025-1036
American School of Aviation	1056
American School of Photography	1034
American Technical Society	1038
American Telephone & Telegraph Co.	1043
Anita Institute	1040
Arkograph Pen Co.	1036
Arnold Check Writer Co.	2nd Cover
Artificial Ear Drum Co., Inc.	1036
Audel & Co.	Inside Back Cover
B	
Bartlett Mfg. Co.	1056
Batenburg, P. J. F. Co.	1042
Beauville Company	1045
Bernard & Heller	1030
Bliss Electrical School	1060
Bogue, Benjamin N.	1040
Breidert, George	1044
Bureau of Inventive Science	1060
Burns, Farmer	1046
Bush, David V.	1050
C	
Chicago Gear Works	1056
Clarkson Pub. Co.	1054
Classified Advertising	1062
Cilliers, P. F. & Son, Dist. Corp.	1035
Conn., Ltd., C. G.	1055
Coyne Electrical School	1045
Crusader Apparatus Co.	1040
D	
Deagan, J. C., Inc.	1050
Deta Specialty Company	1039
Detroit School of Lettering	1056
Dobe, Engineer	1047
Dougas, Lyle	1048
Drake, Frederick J. & Co.	1034
Dryer, J. A.	1034
Du Maurier Co.	1054
E	
Encyclopaedia Britannica	973
Ethyl Gasoline	978
Evans & Co., Victor J.	1033
Everyday Life	1055
Excello Products Corp.	1056
F	
Federal School of Illustrating	1037
First Hawaiian Cons. of Music	1056
Fisher, Adam Mfg. Co.	1032
Foley Mfg. Co.	1048
Ford, G.	1059
Franklin Institute	1055
Freethought Press Association	1027
G	
Gerstner, H. & Sons	1032
Gilson Slide Rule Co.	1056
Gottlieb, Edward	1032
Gregg Publishing Co.	1054
H	
High Frequency Laboratories	1034
Homebuilderes Soc.	1051
Honigman, A.	1040
Hoodwin, Chas.	1042
I	
Ideal Aeroplane & Supply Co.	1034
Inkograph Co.	1048
Instruction Bureau	1048
International Correspondence Schools	1034-1042-1064
International Typewriter Exchange	1047
Inventors Finance Corp.	1030
J	
Jackson Research Laboratories	1042
Jenkins Corp.	1036-1038-1054
K	
Keeley Institute	1047
Kirk, W. J.	1049
L	
Laboratory Materials Co.	1058
Lacey & Lacey	1032
Lancaster, Allwine & Rommel	1030
Landon School, The	1057
La Salle Extension University	1044-1055
Leonard, A. O.	1048
Liederman, Earle	1053
Lincoln Airplane & Flying School	1038
M	
McGraw Hill Book Co., Inc.	1041
Marvel Mfg. Co.	1056
Mead Cycle Co.	1054
Metal Cast Products	1054
Michigan Model Airplane Supply Co.	1048
Midland Appliance Corp.	1048
Miller, Carl	1032
Modern Mechanics	1029
N	
National Electrical School	1058
National Model Aircraft	1060
National Radio Institute	969
National School Visual Education	1046
National Vulcanized Fibre Co.	1057
Newcomer Associates	1036
Newell Pharmacal Co.	1040
New Method Mfg. Co., Inc.	1060
New York Electrical School	1032
New York Institute of Photography	1046
O	
O'Brien, Clarence A.	1031
Ogilvie Publishing Co.	1054-1058
Old Town Canoe	1060
P	
Page, Davis School of Advertising, The	1045
Pan American Band Instr. & Case Co.	1048
Petroleum Engineering University	1055
Piccadilly Hotel	1054
Plapao Co.	1036
Polachek, Z. H.	1032
Popular Science Monthly	1057
Publishers' Cassified Service	1047
Q	
Quaker Shirt Corp.	1056
R	
R. C. A. Institutes	1023
Radio & Television Institute	972
Radio Training Association of America	975
Randolph & Co.	1030
R. B. Specialty Co.	1034
Roat & Lohman	1043
Rosecliff Shirt Co.	1044
Royal Diamond & Watch	1036
S	
Schiercke, Henry	1055
School of Engineering of Milwaukee	1056
See-Jay Battery Co.	1064
Selmar, H. & A., Inc.	1040
Shure Bros.	1048
Sinclair, Jas.	1040
Smith & Smith Publishing Co.	1055
Snyder, J. D.	1044
Speednut Corp.	1048
Stahl's Outdoor Enterprises	1054
Stay Prest Co.	1040
Strongfort Institute	1063
Studebaker Corporation of America, The	977
Studebaker, G. M., Jr.	1034
T	
Tamblyn, F. W.	1034
Teleplex Co.	1054
Thorola Radio Products	1057
Townsend Labs.	1035-1058
Treasure Sales Company	1036
U	
Universal Aviation Schools	1051
U. S. Model Aircraft Corp.	1043
V	
Von Hoffman Aircraft School	1057
W	
Wallace Co., J. D.	971
Whirlwind Mfg. Co.	Back Cover
Wilson, George	1049

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

WHAT EVERY ELECTRICIAN WANTS TO KNOW!

JUST OUT!—*Latest Exact Information from A to Z!*

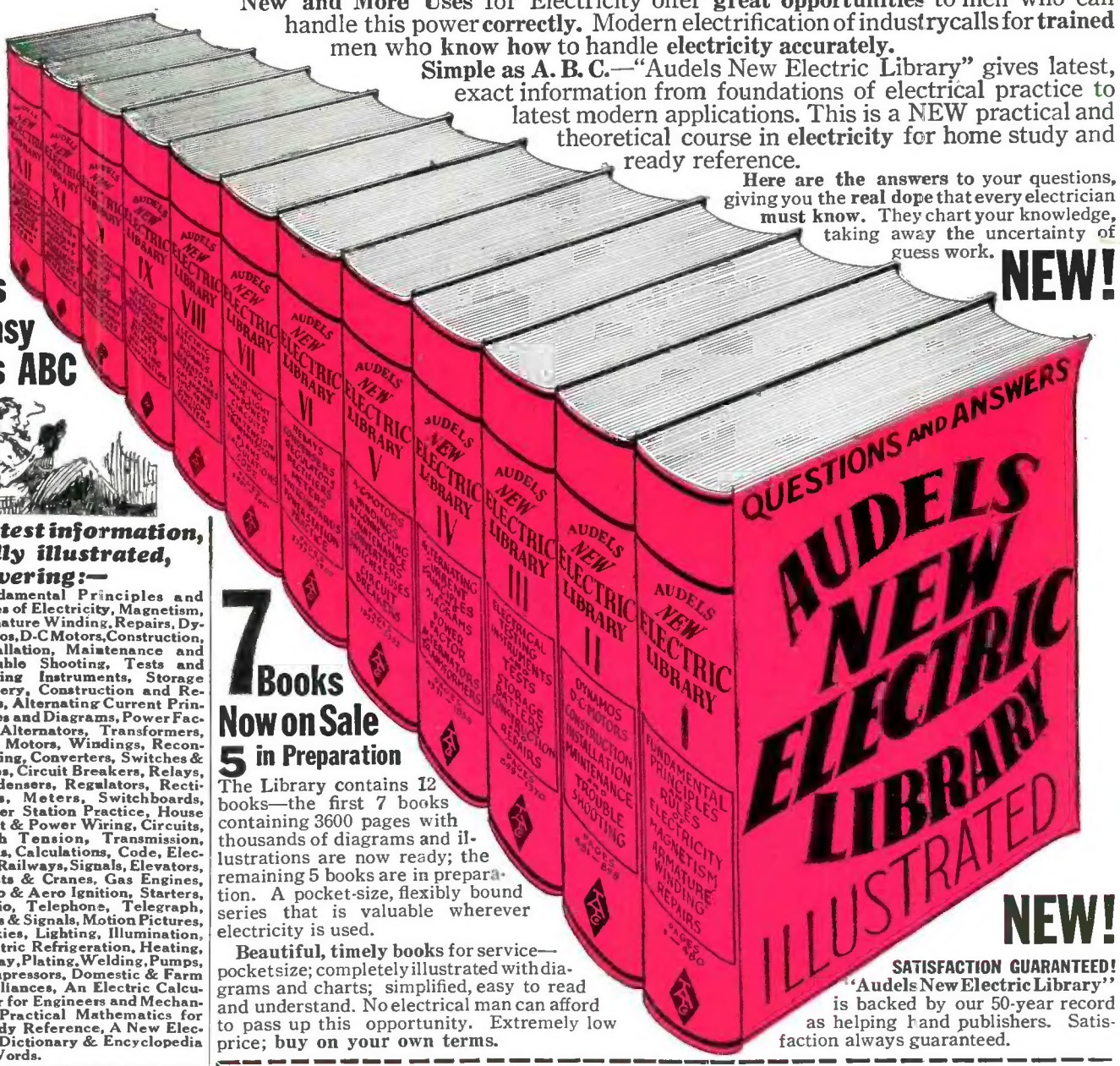
We take pleasure in announcing: "AUDELS NEW ELECTRIC LIBRARY"

New and More Uses for Electricity offer **great opportunities** to men who can handle this power **correctly.** Modern electrification of industry calls for **trained** men who **know how** to handle **electricity accurately.**

Simple as A. B. C.—"Audels New Electric Library" gives latest, exact information from foundations of electrical practice to latest modern applications. This is a NEW practical and theoretical course in **electricity** for home study and ready reference.

Here are the answers to your questions, giving you the **real dope** that every electrician **must know.** They chart your knowledge, taking away the uncertainty of guess work.

NEW!



As Easy As ABC

Latest information, fully illustrated, covering:—

Fundamental Principles and Rules of Electricity, Magnetism, Armature Winding, Repairs, Dynamos, D-C Motors, Construction, Installation, Maintenance and Trouble Shooting, Tests and Testing Instruments, Storage Battery, Construction and Repairs, Alternating Current Principles and Diagrams, Power Factor, Alternators, Transformers, A-C Motors, Windings, Reconnecting, Converters, Switches & Fuses, Circuit Breakers, Relays, Condensers, Regulators, Rectifiers, Meters, Switchboards, Power Station Practice, House Light & Power Wiring, Circuits, High Tension, Transmission, Plans, Calculations, Code, Electric Railways, Signals, Elevators, Hoists & Cranes, Gas Engines, Auto & Aero Ignition, Starters, Radio, Telephone, Telegraph, Bells & Signals, Motion Pictures, Talkies, Lighting, Illumination, Electric Refrigeration, Heating, X-Ray, Plating, Welding, Pumps, Compressors, Domestic & Farm Appliances, An Electric Calculator for Engineers and Mechanics, Practical Mathematics for Ready Reference, A New Electric Dictionary & Encyclopedia of Words.

7 Books Now on Sale
5 in Preparation

The Library contains 12 books—the first 7 books containing 3600 pages with thousands of diagrams and illustrations are now ready; the remaining 5 books are in preparation. A pocket-size, flexibly bound series that is valuable wherever electricity is used.

Beautiful, timely books for service—pocket size; completely illustrated with diagrams and charts; simplified, easy to read and understand. No electrical man can afford to pass up this opportunity. Extremely low price; **buy on your own terms.**

NEW!

SATISFACTION GUARANTEED!
"Audels New Electric Library" is backed by our 50-year record as helping hand publishers. Satisfaction always guaranteed.

Beautiful, Timely Books

Read for Profit

BUY ON YOUR OWN TERMS

☐ **PLAN 1—ONE BOOK A MONTH**
Please enter my subscription to "*Audels New Electric Library*" to consist of twelve volumes, price $1.50 a volume ($10.50 for the seven volumes now ready). Mail one volume each month and as they are received, I will mail you $1.50 promptly.

☐ **PLAN 2—PAY 50c OR MORE A WEEK**
Please ship me for one week's free trial the first seven volumes of "*Audels New Electric Library*," $1.50 each ($10.50 for the seven volumes now ready). The remaining five volumes to be mailed as issued at $1.50 a volume. If satisfied, I will mail you 50c or more each week as payment for the first seven books and I will pay for the last five numbers as I receive them at $1.50 each.

☐ **PLAN 3—CASH PRICE $9.98**
Please ship me postpaid "*Audels New Electric Library*" for which I enclose remittance $9.98 in full payment for the seven volumes now ready.
You are to ship me on one week's trial the remaining five volumes as they are issued for which I will either pay $1.50 each as received or return to you. This price is based on 5% cash discount.

THEO. AUDEL & CO.,
65 West 23rd St., New York, N. Y.

Please ship me the NEW **"Audels Electric Library"** on the plan marked (X).

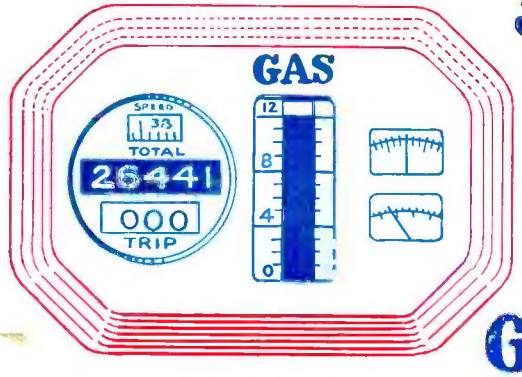
NAME .....

ADDRESS .....

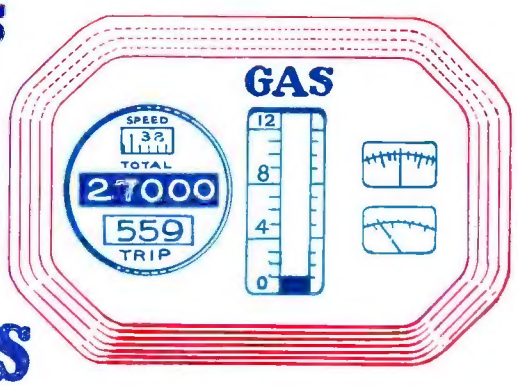
OCCUPATION .....

EMPLOYED BY ..... S. I. Mar.

Over the Mountains from Los Angeles



559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. This is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25 to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine, the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tuttle: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to gallon and 25% in speed. We placed another on a Willy's Knight, and increased from 12 to 17 miles per gallon.

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste. Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck, or tractor. It's actually less work than changing your oil, or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

Free Sample and $100.00 a Week Offer

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999-150-A Third Street Milwaukee, Wisc.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE TRIAL COUPON

WHIRLWIND MANUFACTURING CO.
999-150 A Third Street, Milwaukee, Wisc.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and free trial offer. This does not obligate me in any way whatever.

Name .....

Address .....

City .....

County ..... State .....

☐ Check here if you are interested in full or part time salesmen position.